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The Geographical Journal.

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The
Geographical Journal.

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ACROSS THE PURCELL RANGE OF BRITISH COLUMBIA.*

By Dr. T. G. LONGSTAFF.

The Selkirk system of British Columbia is usually described as consisting of the Selkirks proper on the west and the Purcell range on the east. The "Nelson's mountains" of David Thompson's map include the northern end of the Selkirks and nearly the whole of the Purcell range. I am inclined to think that his "Mount Nelson" in the latter range, obviously a particularly prominent mountain, can be identified with the peak now known as Mount Hammond. At any rate, both are in the same neighbourhood, and Dawson's "Reconnaissance map" of 1886 places Mount Nelson in about the same position. Since the name Purcell range is not in use locally, it seems a pity that such an opportunity was not taken to perpetuate Thompson's nomenclature. But the title has been officially adopted, and must be adhered to.

Though the Purcell range is generally admitted to form part of the Selkirk system, Dawson has adduced arguments for considering each as totally distinct from the other. In any case, its natural boundaries are unusually obvious. It is separated from the Rocky mountains on the east by the valleys of the northward-flowing upper Columbia river and of the southward-flowing upper Kootenay river, which together constitute a part of the great Rocky mountain trench, one of the most remarkable features of the North American Cordillera. The Purcell range is separated from the Selkirks proper on the west by a smaller but equally well-defined trench, which Daly (*Geographical Journal*, vol. 27, p. 600) has aptly designated the Purcell trench. The northern end of this trench is represented by the valley of the northward-flowing Beaver river, whose confluence at an acute angle with the upper Columbia river forms in

* Royal Geographical Society, March 13, 1911. Map, p. 700.

fact the northern boundary of our range. Crossing the low (4600 feet) Beaver-Duncan divide, the Purcell trench continues southward, occupied successively by the southward-flowing Duncan river, Howser lake, the long fjord-like north and south arms of Kootenay lake, and the northward-flowing lower Kootenay river, whose acute-angled bend in Montana forms the southern boundary of the Purcell range, just as the Big bend of the Columbia river forms the northern limit of the Selkirk system. The remarkable courses of these two great rivers, the Columbia and the Kootenay, can hardly escape comparison with those of several rivers of the Himalayan region. The Selkirks, including the Purcell range, are much older than the Rocky mountains; they represent in this region and for a distance of 300 miles the original main axis of the North American Cordillera. As in the case of the two great Himalayan ranges, the younger range is now higher than the older. On the other hand, in the North American Cordillera it is the younger Rocky mountain range, and not the older Selkirk range, which now constitutes the main water-parting.

The Purcell trench and the corresponding portion of the great Rocky mountain trench run approximately parallel to one another in a north-western to a south-eastern direction. The figure of the Purcell range may therefore be described as that of an elongated lozenge having a length of about 250 miles, and for half this distance an average breadth of about 50 miles. The southern half of the Purcell range, like the southern half of the Selkirks proper, attains no great altitude, and is crossed by the Crow's Nest railway and by several trails. But the northern half rises well above the snow-line into numerous bold glacier-draped peaks. In this portion of the range the surface or drainage area of the eastern slope is uniformly greater than that of the western slope. Precipitation comes primarily, of course, from the Pacific.

The Dog Tooth mountains and the Prairie hills at the northern extremity of the range have been accurately surveyed by Wheeler. South of these are the Spillimacheen mountains, a portion of which are indicated on Drewry and McArthur's sketch-map of 1892. The same area is shown in outline on Mr. F. C. Lang's prospector's map. The headwaters of the south fork of the Spillimacheen, Bugaboo, and Salmon rivers on the east, and of the Reno and Howser creeks on the west were obviously unsurveyed, and are very imperfectly known to a few trappers and prospectors. South of this, again, trails run westward into the mountains at the sources of Horse Thief creek, where the scenery is reported to be very fine. In this section is situated Mount Hammond, the first ascent of which was accomplished by Mr. Ellis, of Windermere, in 1910. Its height is reported to be over 12,000 feet, but this estimate requires confirmation.

South of this, again, comes the fine trail from the lower Columbia lake, now known as Windermere lake, to the head of Kootenay lake.

SPILLIMACHEEN SPIRES FROM THE EAST.

(A. O. Wheeler, photo.)

SPILLIMACHEEN SPIRES FROM THE WEST.

This pass over the Purcell range has long been known as Wells pass, and is so shown on the Provincial outline map, but the name has recently been changed to Earl Grey's pass, the changing of geographical nomenclature being unfortunately only too common in Western Canada. Those well-known peaks, the Hermit and Mount Carrol on either side of Rogers pass, are now shown on the Dominion maps as Mount Tupper and Mount McDonald, and I heard with regret that the name of Wild Horse peak, east of Fort Steele, is to be changed to Mount Fisher. South of Wells pass the mountains begin to decrease in altitude, and the country, though by no means fully explored, appears to be of less interest.

The suspension by the Dominion Government of topographical surveys in the Alpine ranges of Canada leaves the would-be explorer with a very wide range of selection, but the imminent opening up of the upper Columbia valley by the Canadian Pacific Railway indicates the northern half of the Purcell range as a particularly desirable field for mountain survey work, and I at once fell in with the suggestion of my friend Mr. Arthur O. Wheeler, the well-known mountaineer and lately Topographer to the Department of the Interior, that we should endeavour to cross the range together, and make a survey of the glacier region traversed. We were fortunate in getting Mr. Byron Harmon, of Banff, Alberta, whose Canadian mountain photographs are so deservedly popular, to come with us, and the services of Konrad Kain, the Austrian guide engaged for the summer by the Alpine Club of Canada, were placed at Wheeler's disposal.

We left Golden before sunrise on August 30, 1910, in Captain Armstrong's stern-wheeler, and steamed up the Columbia river for about 40 miles. Dawson describes the upper Columbia valley "as a great flat-bottomed, parallel-sided trough." Its average breadth between the confining mountain slopes is about 5 miles. It is markedly terraced into typical bench lands. The river itself flows tortuously through a depression half to 1 mile in width, containing numerous sloughs.

The upper Columbia river flows down a great strike valley of pre-glacial origin, which probably formerly discharged southward, and is now deeply filled with drift-material. Its eastern boundary is formed by the steep escarpment of the Beaverfoot range of the Rocky mountain system, which here presents an almost continuous wall of bare limestone peaks. The flanking line of the Purcell range on the west present gentler outlines thickly covered with forest, and only assume a rugged character on nearing the main axis of elevation.

Near Spillimacheen landing Captain Armstrong pointed out to us a fine snow-peak to the west named by him, in 1886, Mount Ethelberta. We disembarked at Haffner's landing on the west bank and pitched camp, being joined in the evening by W. B. Barrow and Charles Lawrence with a pack-train of ten horses. We could hear of no trail across the

northern half of the Purcell range except Wells pass along Hamill and Toby creeks. The southern part of the Spillimacheen country was said to be quite impassable for horses. But up the river entering the Columbia between the Spillimacheen and the Salmon, and rejoicing in the name of Bugaboo creek, a trail was known to have been cut some years ago by miners. I learned recently, that one winter about twelve years ago Wells and another pioneer crossed the range on snow-shoes by this route, which we subsequently followed. Local information was to the effect that the main divide at the head of the Bugaboo was impassable for horses, but that Reno creek headed from the reverse slope, and would, if we did force our way over, afford access to the valley of the Duncan river. This turned out to be fallacious, for Barrow successfully got our pack-train over the divide, and on the further side we found ourselves descending Howser river and not Reno creek. Wheeler's idea was to cross the divide to the Duncan valley, and, travelling north, to connect his survey with his old stations on the Prairie hills, returning to the Columbia by another pass over the divide of which we had heard vague rumours. But the country was really unknown, and the actual difficulties turned out to be far too formidable to render such a scheme practicable in the month at our disposal, for the risk of being blockaded in the mountains by an October snowfall had to be reckoned with.

From our camp a good trail led for the first few miles through bench lands clothed with jack pine. Passing to the south of the lower canyon of the Spillimacheen, the trail strikes westward along the northern bank of the Bugaboo river. It becomes rapidly worse after the first 15 miles. In several places it had completely disappeared, and burnt and down timber soon called for the axes and involved frequent *détours*. In one stretch a forest fire was still smouldering in spite of heavy rain all through the previous night.

On the third day after leaving the Columbia, Wheeler selected and occupied a station on the north side of the valley at a height of 7633 feet, while Harmon went up the valley with one of the men to clear a trail for the horses, returning in the evening greatly elated by what he had seen of the remarkably fine glacier at the head of the north fork of the river.

I should here state that the whole of the survey work on this trip was executed entirely by Wheeler. The map, unfortunately for me not yet to hand, and the nomenclature are his. Any discrepancies between my paper and Wheeler's map must be resolved in favour of the latter. Wheeler occupied ten stations between 7000 and 9000 feet in altitude. The theodolite and survey-camera outfits each weighed about 20 lbs., which Wheeler and Konrad had to carry almost daily up very steep wooded slopes to the bare summits, the ascent being excessively fatiguing, not so much from the actual height which had to be made, as from the slippery footing and the constant

FALLS OF THE BUGABOO.
(*Byron Harman, photo.*)

GLACIER AT THE NORTH FORK OF BUGABOO RIVER.
(*Byron Harman, photo.*)

BUGABOO PASS.
(*Byron Harman, photo.*)

"CROSSING THE DIVIDE."
(*Byron Harman, photo.*)

impediment of the vegetation to every upward movement. From this first elevation we saw to the west the upper reaches of a very fine glacier, cropping out of which were a cluster of remarkable peaks. This glacier rises from a group of mountains, the highest of which attains an altitude of 10,244 feet, and was named by Wheeler Howser peak. It turns out to be the highest peak on this part of the divide.

Leaving him at work with his instruments, I scrambled down to the north into a typical alpine hanging valley, showing all the usual signs of glaciation, which cut us off from the Spillimacheen divide. On both sides of the main valley steep hills rise abruptly. Their lower slopes are clothed in forest, and their bare rocky crests, rising on the south side to over 9000 feet, are snow covered. This southern range is dominated by seven peaks, and has therefore been named the Septet range. Ravines, deeply cut by broken mountain torrents, run up into the recesses of the mountains, affording only a very arduous means of approach to the snows.

On September 3 the whole outfit moved on up the valley, here very narrow, keeping to the left hank of the stream. A remarkable spur of bare rock, which I presume gives the name to Rocky Point creek which flows in from the north, almost forced us to take to the water. A trail is said to lead up this glen over to a branch of the Spillimacheen river. For some time we had heard the roar of a waterfall ahead of us, and soon came to a clean step-like ledge over which the whole river is precipitated with a clear drop of between 40 and 50 feet. Above this the valley floor widens out somewhat, and keeps very level right up to and beyond the main forks of the river, suggesting the approach to a region of relatively recent glaciation.

On reaching the forks we had a very beautiful view of Harmon's big glacier, which descends right down to the level floor of the valley well amongst the timber. The "north" fork of the valley runs about east and west, and at first sight appears to be the termination of the main valley. Harmon and I afterwards visited this glacier, and found that its present phase was one of retreat. The ice itself is very clean, and the contrast of colours when seen through the heavy timber is very beautiful. The lateral moraines are well developed and rise high above the shrinking ice. Two fine ice-falls occur in the middle section of the glacier, which is about half a mile broad.

The "south" fork is the main stream of the Bugaboo river, and it was from the head of this that we hoped to get our horses over the divide. We therefore forded the "north" fork and, turning southerly, followed an old miners' trail through dense heavy timber. This led for about half a mile along a ridge which had exactly the form of a lateral moraine. Owing to the undergrowth and the short time at our disposal, proper examination was impossible. But I am inclined to believe that this was in fact a relic of some extremely remote period of ice increase.

Its survival at this particular spot can easily be accounted for by the configuration of the valley at this point, a long spur forcing the river over on to the other side above this remarkable formation, and thus protecting it from undercutting.

The old trail through the heavy timber was frequently completely blocked by fallen giants, and several of the sorely tried horses fell. Late in the afternoon we were stopped by a tremendous windfall, which had been caused by an avalanche from the *opposite* side of the valley. For hundreds of yards the trees were piled in impassable confusion. After some delay we managed to get down into the open muskegs of the valley bottom, which at this season were, fortunately, passable. Our line of march was again westerly. The valley had broadened out to about a mile, the bottom being quite flat, and consisting of grassy muskegs interspersed with small thickets of willow and small timber. To the south a glaciated valley hung 500 feet above us, several waterfalls being visible through the trees. About 5 miles from the forks, we camped on a low gravel bench (*c.* 4500 feet) beside the torrent, now shrunk to very small dimensions. This spot was our headquarters through a week of broken weather, during which Wheeler worked away at his survey whenever possible, and we thoroughly explored the neighbourhood and the pass at the head of our valley.

Wheeler's station, at 7677 feet on the culminating point between the north and south forks of the Bugaboo river, gave us an excellent view of our surroundings. To the south-east the seven peaks of the Septet range separated us from the valley of the Salmon river. To the south a semicircle of glacier-hung peaks cut us off from the south fork of Howser river. To the west was our intended pass across the divide, Howser peak, and the remarkable nunataks or aiguilles rising out of Harmon's big glacier. To the north a lower range marked the divide between the Bugaboo and Spillimacheen rivers. To the east the distant peaks of the Rocky mountains showed through the haze of the Columbia valley.

The extreme limit of timber growth, here represented by larch scrub, is approximately 7400 feet. The height of the pass on the divide to the west, which I suppose must retain the euphonious name of Bugaboo, is about 7160 feet. The old Bugaboo claim, an outcrop of galena, lies on the actual crest of the pass between two large beds of permanent snow. On the further side a valley ran west of south, and, relying on information received, we assumed that it was that of Reno creek. As a matter of fact, it was Howser creek. We could only see the extreme upper end of this valley, which, though deep, was open and fairly wide. It soon turns further to the south, and rapidly contracts lower down, where the torrent flowing between steep forest-clad spurs has deeply eroded it.

By hard work we cleared out the old prospectors' trail, which led through dense brush to the foot of the steep and rocky final slope of the

THE FOUR SQUATTERS FROM THE EAST. SELKIRKS IN THE DISTANCE.

(A. O. Wheeler, photo.)

CENTRAL PURCELL RANGES FROM THE NORTH.

A. O. Wheeler, photo.

pass. After a good deal of digging it proved to be just practicable for the pack-horses, and Barrow negotiated it with great skill and no fuss on September 9. Wheeler, with Konrad, occupied a station of 8081 feet to the north of the pass. I remained on the crest to prepare a light camp for the surveyor, while the pack-train pushed down into the valley on the other side. Some wind-bent balsams offered a chance of shelter, and here I pitched a light silk tent and collected wood. The intention was that Wheeler should occupy another station on a prominent peak to the south of the pass, but a snowstorm that night prevented a start in the morning. We stayed on in our eyrie, hoping for better conditions; but another 6 inches of snow fell during the second night, and we packed our bedding down to headquarters in disgust.

On September 12 Wheeler and Konrad returned to the pass, picked up the instruments left there, and successfully occupied the selected station (8254 feet) south of the pass. On the same day Harmon and I visited a large glacier flowing west down towards the valley from Howser peak. Mounting a steep rocky spur of this peak to a height of about 9250 feet, we obtained for the first time a really comprehensive view of the region.

The contrast between the formerly ice-protected alp-lands and the forest-clad depths of the torrent-eroded lower valleys was most marked. An unexpectedly large portion of the Purcell range was seen to be covered by glaciers and perpetual snow. The most striking peaks were amongst the wild Spillimacheen mountains to the north, but the snow area was greater and the altitude of the range was higher to the south. The culminating point appeared to be a peak about 20 miles to the south. From the remarkable arrangement of cliff and glacier we called it, for purposes of reference, Eyebrow peak. This may turn out to be Mount Nelson or Mount Hammond, which again, as I have already pointed out, may be identical. But I think Wheeler's peak is somewhat too far north. No direct transit readings were taken to the summit, but by the methods of photo-topography an altitude of 11,489 feet was deduced, with a range of only 37 feet for three different computations. Another fine mountain south of the main forks of Howser river, and giving birth to several large glaciers, has been named Mount Aurora. To the west a group of peaks, rising to 9743 feet, and named by Wheeler the "Four Squatters," hung over the misty depths of the Duncan valley, and beyond this, again, were the snowy ranges of the southern Selkirks. Eastward the continental divide of the Rocky mountains loomed mistily through the smoke-haze of the forest fires then raging in distant Washington.

From our camp at the head of the valley—that is to say, at the west foot of the pass we had just crossed—to the forks where the southerly and northerly arms of Howser river unite, a distance of less than 12 miles in a straight line, cost us six days of hard labour. We only made four marches with the horses, but on the other days we cut trail ahead,

CENTRAL PURCELL RANGES FROM THE NORTH.

returning to camp in the evening. We were constantly compelled to ford waist-deep from one side to the other of the broken torrent to avoid the steep cliffs which bordered this section almost continuously. A striking feature of the valley is the beauty and frequency of waterfalls in the side glens. Meanwhile Wheeler continued to occupy high stations, as day by day we made 2 or 3 miles down the valley. The labour of climbing up several thousand feet through undergrowth full of poisonous devil's-club was extremely exhausting, and I found cutting trail with Harmon and the men a much lighter job.

The forest growth on the western slopes of the range is much denser than on the eastern side, and, in consequence, insufficient grass for the horses was a constant source of anxiety. Larch, balsam, spruce, and hemlock gradually gave place to cedar, white pine, and Douglas fir, with cotton wood, at Forks camp (*c.* 3000 feet). Underneath was a dense growth of azalea and blueberry, while the horrible prickly aralia, or devil's club, was everywhere. In places subject to spring avalanches the hillsides are clothed with dense alder, all bent downwards by the weight of the winter snow, and costing much labour to cut through. They are known locally as slides.

On September 18 we reached the point where the north and south forks of the Howser unite, and camped at about 3000 feet in a magnificent cedar forest. From this camp Wheeler occupied a station on a high shoulder of the Four Squatters. Due south was the pyramidal cone of Mount Aurora, sending down a large glacier into a hanging valley, the stream from which discharged into Howser river below our camp.

Since crossing the divide we had seen no sign of a trail, though a trapper had obviously wintered in the valley some years previously. And when, on September 20, soon after leaving Forks camp we crossed the river, now only just passable on foot, and came upon an old trail, we thought that our troubles were at an end. We were soon forced to cross over again to the right bank, this time by felling a tree, only to recross a few hundred yards lower down. Soon after this third crossing we fell in with a trapper who was bringing up his supplies for the winter. He told us that we were on Howser and not Reno creek, and assured us that it was impossible to get horses down the lower canyon, the old trail being carried on staging which was now either rotten or altogether carried away. Owing to the danger of avalanches, he himself would be a prisoner in the valley above this canyon from the first heavy snowfall till after the spring melting.

There was nothing for it but to send our pack-train back over the pass to the Columbia river. Wheeler accompanied it, as he had now to connect up his survey from the other side. Harmon and I walked down with the trapper, doing the 15 miles through the canyon to the Duncan river on September 22, and reaching the hospitable settlement on Howser lake the next day.

As a result of our observations, I feel confident in placing the highest and most glaciated portion of the Purcell range to the south of our pass, and not, as local reports at first led us to believe, in the Spillimacheen mountains to the north. The mountains between Wells pass and the Bugaboo pass may fairly be considered as unexplored ground, and are certainly unsurveyed. The great extent of the snow-fields and the general altitude of the range was quite a surprise to me, and is not, I think, generally appreciated. It undoubtedly offers a very attractive field alike to the topographer and the mountaineer. While access to this region is probably easier than to the Spillimacheen mountains, no attempt should be made to take in a pack-train, except from the Columbia valley side, and, with the possible exception of an old trail down Glacier creek, which is really only a variation of Wells pass, no attempt to get horses over the divide and down to Howser lake is likely to be successful. Horses can be taken up the valley of the Beaver river, over the divide, and on to the upper Duncan river, but they cannot be taken through the valley of the lower Duncan river down to Howser lake owing to a canyon similar to that which stopped our pack-train on the lower Howser river.

My thanks are due to Mr. Harmon for most of the slides which I have shown this evening, and without which my lecture would have failed to convey to you any adequate impression of the country. I trust that in spite of the many calls on his time Mr. Wheeler's map will shortly be ready for publication in the *Journal*, together with his own report. Meanwhile I am greatly indebted to him for the valuable photographs and notes which he has already sent over.

Mr. Douglas Freshfield (Chairman), before the paper: I am sure all present will share the regret that I feel myself in the announcement I have to make, that our President has succumbed to the inclemency of an English spring, and is unable to be here to-night. We are to have to-night one of the mountaineering papers which have become more frequent of late years in the Society. He has therefore asked me, as having some connection with mountain exploration, to take the chair. Mountaineers may be roughly divided into two classes. There is the mountain climber, who tends to lapse into the sportsman and the athlete; and the mountain explorer, who tends to lapse (or should I say rise) into the traveller, the geographer, and the cartographer. The mountaineer has to study the mountains with a very careful eye, because upon his accurate observation of the character of rocks and the condition of snow often depends his safety. He is able to bring back to us valuable details as to the glaciation, the geological structure, and the physical characteristics of the regions into which he ventures. He also, as in the present case, may furnish interesting details with regard to the effects of the atmosphere at high altitudes on the human frame and energies. Dr. Longstaff, who is going to lecture to us to-night, requires no introduction here. We know his name too well. We may say of him that he is the worthy son of a worthy father, to both of whom geography is largely indebted. Dr. Longstaff began his climbing career in the Alps; he then, about seven years ago, went to the Caucasus, where he made a number of brilliant ascents without guides.

Now, to make ascents without guides in the Caucasus shows a very high degree of skill in mountaineering. Since then he has been more than once to the Himalaya, and, as we remember, he came here and gave us a most graphic description of his ascent of Trisul. Though that is not the highest ascent on record, it is the highest ascent in which the actual peak assailed has been climbed. Like many other mountaineers, Dr. Longstaff has succumbed to the charms of the mountains of the West, those two glorious ranges, the Rockies and the Selkirks, which run for hundreds of miles between the great corn-growing plains of the Dominion and the Pacific coast. In the district that is enclosed between what are going to be rival highways of traffic and travel, the present Canadian Pacific and the new Northern Railroad, there is an unlimited field for the mountaineers of the future, and the Canadians are making great efforts to open up that field. We have here to-night Mr. Wheeler, the son of a gentleman who has done much—more than any one, perhaps—to establish and to help the development of the Canadian Alpine Club. By individual and private energy Canadians have done, and are doing, a great deal to explore and map their mountains. But I hear whispers that the Canadian Government does not do what it might in carrying on the official survey of the mountains. I am even told that there is no Government survey party at present at work in the mountains; that those that were have been transferred to the plains. Naturally a young country looks to its immediate development, and corn-lands may naturally come before mountains in the eyes of those who direct the Canadian Survey. At the same time, as geographers, we may express the hope that it will not be long before the Government may see its way to sending at least one, if not two, parties into the mountains to continue the survey which has been begun, and of which excellent specimens may be seen in the next room. There is a legend that an Irishman, climbing on Mont Blanc, was heard to groan, "I should like to see this old mountain rolled out flat and sown with potatoes." I trust that the Canadian Government will not take the view that a country which cannot be rolled flat and sown with corn or potatoes is not worth surveying. With this short introduction, I will ask Dr. Longstaff to read his paper.

Captain Henry Hincks (after the paper): I hardly like to say anything after the interesting account Dr. Longstaff has given of his travels in the Purcell mountains. I live for some six or eight months of each year at Howser lake, but my excursions up the creeks and trails, rather further south than where Dr. Longstaff crossed the mountains, have been with but little geographical object in view. From my house on the south-east side of Howser lake, and on the western slope of the Purcell range, I look upon the "Seven Squatters" which Dr. Longstaff has mentioned. To take a few of the ways by which it is possible to go into the Purcell range, Hamill creek comes first, and the entrance lies some 12 miles south of Howser lake. My first journey up this creek was in 1908, when we landed at Argenta from the C.P.R. steamer late in the evening, and made our way to the entrance of the Hamill creek canyon. This canyon extends for some 3 miles, worn out of the hills by the creek; its deep rocky bed and precipitous sides present a very fine picture. A waggon road to the Argenta mine runs through this canyon, and is in places built out from the sides, running from rock point to rock point over the creek itself, and about halfway down the side of the canyon. On the left is a mountain of about 7500 feet, called Lost mountain (or Mount Lavina ?). The waggon road continues as far as the Argenta mine buildings, and from these you have to more or less find the old trail as far as the summit. In June, 1908, it was impossible to take pack-horses,

as all the bridges on the upper part of the trail were washed out, and we carried what we wanted on our backs. The trail crosses and re-crosses the creek, and the grade is good until you get to the final ascent to the divide, which was then (1908) called Wells pass. Later in the same year Lord Grey crossed this pass, and was so impressed by the grandeur of the scenery that he had a house built on the east side of the pass, and it was re-named Earl Grey's pass. After crossing the divide, you make your way down Toby creek into the Columbia valley. Toby creek itself rises straight out of the ice, and there is from its source a most wonderful view over the ice-field which stretches away apparently continuously northward. At the present time the trail *viâ* Hamill and Toby creeks is excellent, as it has been repaired by the Provincial Government, and it is quite possible to take pack-horses over the summit. It would, however, be difficult, except in a very forward spring, to cross before June, on account of the snow on the summit; but from then onwards the trail would be comparatively easy, as a few prospectors and others still cross the pass during the summer. The trail down Toby creek reaches Wilmer, which I should estimate as some 70 miles from Argenta.

The next trail northwards is up Glacier creek, the first stage of which follows the creek through a smaller canyon until it divides, and from thence a trail follows the course of each creek. Along the northern creek the glacier is reached in rather less than a day's walk; for the last part you leave the timber for a semicircular piece of flat land surrounded by mountains, and covered with dense willow brush, and get a view of another part of the Purcell ice-field. The general course of Glacier creek is much more northerly than is shown in the map, for, if you climb the mountains on the north side of the creek, you look down absolutely on to Howser lake, which lies immediately at the foot of the western slope of the mountains. To reach the ice, following the more southerly of the forks, would take about two days, and as you reach the glacier the trail again loses itself in a mass of willow brush. It would be difficult to cross by either of these trails, but the southerly trail appears to be the easier over the divide; pack-horses would not be much use on either trail. The next trail to the north, with any possibility of reaching the main range, is Little Glacier creek, and is hardly worth mentioning. It starts from the glacier, and joins Howser lake at the north end, almost where Dr. Longstaff came out of the mountains, and, after the first mile, is practically impassable. A branch trail leaves the creek and joins the Howser creek trail, and following Howser creek down comes out on to the Duncan river at the mouth of Howser creek. This trail is impassable for horses.

Lieut. A. O. Wheeler: I do not think I can add anything to what Dr. Longstaff and Captain Hincks have already told you, as I have never been actually in that country, but, judging from the valleys 50 miles to the north of it—we tried to cross from Canyon creek to the north fork of the Spillimacheen—I should think that Dr. Longstaff must have had considerable difficulty with the Howser creek valley. There seemed to us to be many fine peaks in that direction, but, as Mr. Freshfield has said, nothing is being done towards mapping them, which is a great pity, for that part of the Purcell range is certainly interesting both to the mountaineer and sportsman.

Mr. A. L. Mumm: About three years ago I thought that the expeditions made by Dr. Collie, Mr. Woolley, and others in the neighbourhood of the Canadian Pacific railway had practically skimmed the cream off the Canadian Rockies and the Selkirks in the matter of mountain exploration. During the last two years I have been gradually learning that this is a great mistake, as regards the

Rockies, and that the interest of the country from this point of view extends continuously to Mount Robson, and far beyond it. This evening I have learned that the notion that the Selkirks too were exhausted is quite erroneous, and that there is an immense field still remaining for further exploration there. To turn to a minor point: hitherto my impression has been that waterfalls were rather a weak point in Canadian mountain scenery. I have only come across one or two that were of any interest. I was very much struck with the succession of fine waterfalls which Dr. Longstaff showed us to-night from a comparatively small area.

Mr. FRESHFIELD: If no other Fellow wishes to address the meeting, I will wind up the discussion. I think Dr. Longstaff and the other gentlemen who have spoken have given us a very clear idea of what travel in the Rockies and the Selkirks is like, and from the photographs shown we have also improved our ideas of the physical characteristics of the country. The first thing that struck me, from the geologist's point of view, was what strong evidence there is of a former extension of ice over the whole of the upper region, and also of a very marked recent retreat of the glaciers, while the main valleys below the ancient snow-line have been deepened by river erosion.

Dr. Longstaff made some pointed remarks about the giving of personal names to mountains. There are, of course, occasions where it may be desirable to give personal names to natural objects, as, for instance, in the icy solitudes of the poles, where nobody has lived or been before and there are consequently no native names; but I dislike very much giving personal names to mountains, and I dislike it for a personal reason, which I will explain. Some ill-advised climber gave the names of former Presidents of the Alpine Club to the peaks of a certain group in the Rockies. There is a Mount Bryce, and a Mount Woolley, and a Mount Freshfield. The next climber found my namesake an easy climb, and forthwith a paragraph appeared in the newspapers, "Freshfield proves an impostor!" I mention this as a warning to those who may wish to commemorate their friends in a similar manner. Lastly, with regard to the scenery, I must confess I have never been West myself, and I speak therefore with imperfect knowledge, but when I compare my memories of the Caucasus and the Himalaya and the photographs we have seen to-night, I do a little wonder at the passion which makes our mountaineers leave the Old World for the New. It seems to me, granted all the beauty of these photographs, that there is less variety in the forests, and less variety and less boldness in the forms of the peaks. One reason, perhaps, which makes our mountaineers go West is that they feel they are in our own country; they feel more at home. Another reason undoubtedly is the hospitality with which they are always received. I should like to express on behalf of English mountaineers what we all feel, our sense of the extreme kindness shown to us by Canadian climbers and residents. I am sure you will agree with me in wishing to pass a most hearty vote of thanks to Dr. Longstaff for the interesting and instructive paper he has read us, and further agree with him in his hope that the Dominion Government may before long find time to continue the progress of the survey of their mountain regions.

EXPEDITION TO SPILLIMACHEEN MOUNTAINS, SEPTEMBER, 1910—PHOTO-TOPOGRAPHICAL SURVEYS.

By ARTHUR O. WHEELER.

THE following note, dealing with the technical part of the work, is written to supplement the account prepared by Dr. Longstaff of a short expedition to the Spillimacheen mountains of British Columbia made by the doctor and myself on behalf of the Alpine Club of Canada during the month of September, 1910.

For a number of years, as Topographer of the Department of the Interior of Canada, I had been in charge of a photo-topographical survey of the Main and Selkirk ranges of the Rocky mountains, within what is known as the Railway Belt of British Columbia—a tract of land extending for 20 miles on either side of the line of the Canadian Pacific railway through the province named.

The Spillimacheen mountains lie between the Columbia river on the east and the Beaver river, Duncan river, and Howser and Kootenay lakes on the west. They are an outlying group of the Selkirk range on the eastern side of its main watershed. From high peaks in both the main range of the Rockies and the Selkirk range I had frequently gazed on the Spillimacheen mountains, and seen wide snowfields and glaciers, with most interesting-looking peaks, pyramids, towers, and pinnacles rising from their midst. I had also heard of wonderful waterfalls and amphitheatres at the heads of the many deep valleys by which the region is intersected. Rumours had reached me of 12,000-feet peaks—an altitude not great as the high mountains of the world go, but great for the Selkirks—to be found there. A long-standing desire to visit these mountains was brought to a focus by the collaboration of Dr. Longstaff, and an expedition was arranged to begin soon after the Alpine Club of Canada's annual camp, held at Consolation valley, and a short expedition made after it by a chosen few should be over.

It was intended to ascend the Columbia river, from its intersection with the railway at Golden, to the mouth of the Spillimacheen river, and then by the middle branch of that stream to the summit of the group and across the same to the Duncan river; then up the Duncan and down the Beaver river to the railway at Bear Creek station, keeping, if possible, to the high slopes above timber-line along the western side. Unfortunately, the routes across these mountains by both the middle and south branches of the Spillimacheen were reported closed for pack-animals by fallen timber and bridges washed out, so we were forced to go still farther south and attempt the passage by Bugaboo creek. This route was reported feasible by the best authorities on the subject in the Columbia valley above Golden. The Selkirks, however, are a very uncertain quantity, and Dr. Longstaff has told you how we fared.

My previous photo-topographical surveys had been carried on the

east to cover the Dogtooth range, lying north and east of the north branch of the Spillimacheen river, and on the west along the summit of the Selkirk range as far as the northern extremity of the Spillimacheen mountains, which that summit overlooks (see accompanying map). It was now attempted to carry a survey, using photographic methods, across the Spillimacheen mountains, *viâ* Bugaboo creek and pass, to the Duncan river, and then northward to connect with previously established stations of the Selkirk and Dogtooth ranges of which the position and altitude were known, thus fixing the position and altitudes of the present survey.

The use of the method of photography as applied to measurement by means of perspectives, was first conceived by the late Colonel A. Laussedat of the Institute of France and Director of the Conservatoire National des Artes et Métiers, as far back as 1849. To Major-General Annibale Ferrero, Director of the Geographical Military Institute of Italy, is due the credit of initiating the ordnance photographic surveys of the present day. Their execution was carried out by the celebrated engineer, L. Pio Poganini, with a staff of able assistants, about the year 1876. Its application to Canadian topographical surveys, upon which it has been most extensively used, is due to Dr. E. Deville, Surveyor-General of Dominion Lands, who, in 1895, published a concise and valuable work upon the subject, entitled "Photographic Surveying." Unfortunately, the book is out of print, and a most complete and ready reference to the history and theory of this section of the science is thereby lost to the scientific world.

The Canadian field-equipment consists of a plain fixed-focus camera, and an ordinary 3-inch circle transit-theodolite, with vertical circle attached to the telescope. A short, stout tripod is adapted to receive either. Each instrument weighs about 20 lbs., the camera including one dozen glass plates and holders, and is carried separately. The camera is an oblong aluminium box cased in wood. Cross levels are attached to the metal box in two positions, which for the sake of recognition have been called the "horizontal" and "vertical." The levels are adjusted by foot screws on the tripod. Plates are used, the size being $6\frac{1}{2}$ by $4\frac{3}{4}$. Films have been tried, but are too subject to distortion when passing through the developing process to give sufficiently accurate results. In the horizontal or longer position the lens covers 56° of arc, and seven plates are required to complete a circuit. In the vertical or shorter position the lens covers 37° of arc, and eleven plates are used. There are instruments in use for this method of surveying that combine the transit-theodolite and camera in one piece, but they are cumbersome and difficult to pack to the summits of high mountains; others use the magnetic needle and register its readings upon the photographs obtained, thus giving them direction. Such an instrument as the latter would be useless in the Canadian rockies, owing to local attraction from scattered iron masses.

It is necessary that the photographic work be based upon a plan of triangulation, which may be carried to any degree of accuracy. In quick exploration and reconnaissance surveys the triangulation and photographing can be carried along together. Altitude is obtained by reading the angles of elevation or depression between stations, and either starting from or connecting with known points. To orient, or obtain the direction of a view, the azimuth or angle must be read between some fixed point and a point in the view which will be clearly discernible on the working print. It is absolutely essential that views be taken on plates in a vertical position; it is, therefore, necessary that the levels on the camera be in perfect adjustment. The focal length of the camera is marked on the edge of the metal-box against which the plate presses and is registered on every view taken.

As the whole reduction of the perspectives obtained to a ground plan is dependent upon the focal length of the camera used, this registering is very necessary. Notches in the edge of the box also register the horizon and principal lines of the perspective.

Practically speaking, the views obtained are perspectives, from which, by the rules of geometry and perspective, the general topographical features embraced may be projected upon a ground plan. It is necessary that such features can be seen in at least two views taken from stations some distance apart, and of which the position and elevation above a given datum, generally sea-level, have been or can be ascertained from the triangulation. A topographical map usually consists of contour-lines, representing the projection on the plan of imaginary lines following the inequalities of the surface at given intervals of altitude. A sufficient number of points along the ridges and dividing watercourses, or other suitable places of the area embraced by the views, are identified in the photographs to enable contours to be drawn at the required equidistance. On the plan the points are placed in position by projecting thereon the traces of the horizon and principal lines of the two or more views employed, and the lines of sight from each camera station to the said points projected on the horizontal traces. The intersection of the projections of the lines of sight fixes the position of a point. The altitudes of the points are based upon the elevation of the stations from which the views are taken, and are obtained directly from the photographs. The horizon line, which is registered on every view, corresponds to the altitude of the station. The elevation of any point in a photograph is proportional to its height above or below the horizon line, and the distance its projection falls within or beyond the trace of that horizon line. When the distance becomes so great as to make curvature and refraction appreciable factors corrections must be applied, but it is not, generally speaking, practical to map by this method at so great a distance. The method is very similar to that of the plane-table, but has some strong advantages. With the plane-table most of the plotting is done in the

field, with the camera altogether in the office; with the plane-table one station is occupied at a time, with the camera views from both stations before you, and thus you practically occupy both stations at once. This last is a very important factor in the identification of points. Photographs, however, give but a weak representation of Nature's contrasts, even at their best. Those who have climbed high mountains and know the climatic conditions there, will readily appreciate the ease and facility of taking a round of photographs and reading a number of angles as compared with the delicate drawing operations required for a plane-table. I may add that during fifteen years of experience I have found that very few photographs are obtained with the Canadian equipment that cannot be used for mapping purposes, and those only when the atmosphere is thick with smoke from forest fires, as is frequently the case in the Canadian rockies. Storms and clouds will occasionally prevent the successful occupation of a station, and necessitate a second or even a third ascent, but such occurrences are infrequent.

The above are the fundamental principles of the method. Numerous geometrical constructions, however, assist in obtaining elevations along ridges and definition of figures in planes parallel or inclined to the ground plane. They require the use of perspective instruments, such as the centrolinead, the perspectograph, the perspectometer, and the photograph board. For the most part they can be dispensed with. The accuracy and detail of the mapping is dependent on the precision of the base triangulation, the number of the camera stations, and the scale of the map.

While adapted to all classes of country where there are sufficiently defined contours and contrast of features to show clearly on a photograph, the method is best of all suited to the delineation of rugged, snow-clad mountainous country, where access is difficult and ordinary methods would be impossible.

The method is especially suited to geographical exploration and quick reconnaissance surveys of required areas. Surveys of this character may be carried up valleys of main waterways and extended over important lake basins. While an exploration party with its attendant machinery is slowly making headway up a valley, commanding points along its margin may be occupied by the camera and transit, and by such means a quick triangulation carried up it, the photographs gathering all the requisite topographical information more accurately than by actual exploration. It is, of course, essential to have either a starting-point or closing point; but this is equally necessary for any other method. Similarly a lake basin or any desired area can be mapped, provided there are points of sufficient altitude bounding or within the area to display it in detail to the camera. It may be contended that the occupation of each camera station will entail an arduous climb; that is a small matter to any one desirous of mapping a given area of country.

Two persons only are necessary for the camera and transit work, and one may be a porter to help carry the instruments. It has also been contended that the sides of mountain valleys are often too precipitous to permit of the camera seeing into them, on account of the necessity for the plate being vertical when exposed. It is seldom, however, that stations cannot be found to give a raking view. A strong point in favour of the method is that altitude is carried by angles of elevation and depression from point to point, read back and forth between the stations, and all others are taken direct from the photographs. The photographs, moreover, furnish the best possible permanent records from which to study at your ease the country passed through, when far away from it. From them by the above methods can be obtained an immense amount of most valuable information, such as the height of surrounding peaks (especially referred to below), the length, width, and fall of the glaciers, the drop of waterfalls, the depth of precipices, the dip and thickness of strata, the altitude of timber and permanent snow-line, the course and fall of streams, the area of lakes, snowfields, etc., and the processes employed by Nature in carving out the terrain from the original upland.

I wish to refer briefly to two instances where photo-topographic methods are of special use: (1) The method of squares is particularly adapted to the delineation of lakes, or of rivers, large and small, flowing through bottom lands that may be heavily timbered and inaccessible to travel except by the waterway itself. From camera points above such valleys bird's-eye views can be obtained where all the windings and side channels, islands, and other details are shown as on a map. The perspective of a series of squares is drawn upon the photograph covering any section of a stream or lake, and a corresponding series of squares drawn in proper position on the plan. The channels, islands, etc., are then drawn at sight, square by square. It will readily be seen that such a delineation could not be obtained by ordinary methods of traverse, except at a great expenditure of time and money, as it would be impracticable in a rapid survey to follow every channel or delineate every island where there were many. The advantage, moreover, of being able to do all this at your leisure in a comfortable office is obvious. (2) The possibility in mountainous tracts of obtaining from photographs, taken as explained, a fair estimate of the height of surrounding peaks is one upon which I desire to lay particular stress. When making a photographic survey of the Selkirk range adjacent to the Canadian Pacific railway, I had occasion to take a series of views from commanding points in which a number of the highest peaks of the adjacent main range of the Rockies were identified. Among these were Mounts Columbia, Bryce, Lyall, and Forbes. As a matter of experiment, it was endeavoured to compute from the photographs the altitude of the peaks named, the methods employed being the same as those used in the

ordinary reduction of altitudes for points when drawing contours. The results were as follows: Mount Columbia, 62 miles distant, computed from photographs at four different stations, gave a mean altitude of 12,723 feet, with a range of 261 feet; Mount Bryce, 58 miles distant, a mean of six computations, showed a result of 11,685 feet, with a range of 235 feet; Mount Lyall, 52 miles distant, from four stations gave 11,459 feet, with a range of 271 feet; Mount Forbes, 50 miles distant, from four stations, gave 12,069 feet, with a range of 355 feet. In each case the extreme distance apart of the computing stations was a little over 18 miles. The wide range may be accounted for by the fact that the lines of sight were oblique, and consequently a greater difficulty met in plotting their position accurately at so long a distance.

It may be mentioned that before making the above computations the same method was tried upon Mount Chancellor, 45 miles distant, and directly opposite the base. Chancellor had been established by the Topographical Survey at 10,780 feet. It was now computed from four photographs with a mean result of 10,751 feet and a range of 41 feet, or 29 feet less than the established altitude. The lines of sight, however, in this case provided a sharp-cut intersection. While I do not hold that results so obtained can be considered of absolute value, they give a fair approximation as primary estimates for peaks of which the height has not been or cannot be established by accurate triangulation methods.

These were the methods used upon our expedition to the Spillimacheen mountains. Dr. Longstaff has shown how circumstances combined to prevent a successful termination. Owing to such circumstances, we were unable to connect the survey made with definitely fixed points. However, all was not quite lost, and the data obtained will permit of a map that will be a useful guide for the future. It has established the connection between Bugaboo and Howser creeks, and shows the position and extent of most of their tributaries. It further establishes the position of the headwaters of the south branch of the Spillimacheen river. Of all this there has been heretofore a most hazy idea. Even the local guides at the mouth of Bugaboo creek could give us no definite information, and that fact contributed largely to our failure to accomplish our primary object.

On the other hand, the results are tentative. I was unable to obtain a definite point from which to carry the altitudes, and therefore had to assume one. My observations during previous Selkirk surveys had placed the average timber limit at 7300 feet, so I set the lowest part of the Bugaboo pass at 7160 feet—an altitude not very far astray, one way or the other. As a working base the distance between two stations, occupied on either side of the pass, was set at $1\frac{1}{2}$ mile. This seemed to agree with our distances as estimated by travel. It means that all stations and the topography mapped from them are placed relatively in

proportion to the length of that base, but subject to its error. Altitudes are obtained by angles of elevation or depression from the several stations and by the relative heights above or below the horizon lines of the photographs used, but for accuracy are subject to the true distance from such stations; they are, therefore, not absolute.

From the data used the peaks were found to be, for the most part, between 9000 and 10,000 feet, but a few of the highest exceeded that altitude. One, Eyebrow peak, computed from photographs, gave an altitude of 11,489 feet, which, if true, would establish it the second highest peak in the Selkirks computed by trigonometrical methods. Of this altitude I have considerable doubts, although to reduce it would shorten the distance from the observing stations, and consequently the length of the assumed base, a reduction that would be at variance with the length of our estimated stages of travel.

Dr. Longstaff has set before you the claims of the area from alpine and hunting points of view. The above notes are intended to give an idea of the aims of the expedition in the interests of geographic research, and of the methods employed with that end in view. I regret I am not able to furnish a map of the country surveyed in time for Dr. Longstaff's paper; but Canada at the present moment, and particularly the west of it, is in a high state of development, and there have been many calls upon my time professionally.

CAPTAIN SCOTT'S ANTARCTIC EXPEDITION.

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S.

THE letters received from Captain Scott and the members of his expedition have relieved us of much anxiety. Very excellent winter quarters have been established at Cape Evans, with eighteen ponies in good condition, two motors, and thirty-one dogs. The house was built, all stores landed, and the depôt party had started by January 26 for a journey of two months, with eight ponies. We must wait for a year before we can receive news of the results of a great enterprise. This Society takes a very special interest in the expedition, because it is the necessary complement of our own most successful venture, and is commanded by our own carefully selected and well-tried leader.

The catch-penny expression "race to the south pole" is much to be deprecated. The expedition, which includes the south pole in its contemplated work (being the apex of the Victoria Quadrant, which is Scott's allotted sphere of exploration), is a scientific one, the most complete and the best-equipped for scientific work that has ever entered the Polar Regions. People will think of Amundsen's proceeding according to their training and education. Captain Scott is not a man to be put out by it.

Our gallant countrymen are now entering upon the severities of

an Antarctic winter. I would urgently impress upon my colleagues that the expedition is in great need of generous support. A sum of £10,000 is still required. If the subscriptions are withheld or diverted, there will not be the means of paying for the services of men who are risking their lives for science and their country. They have all cheerfully volunteered with that possibility before them; but can such a thing be? Let it be recollected that it is the continuation of our own work, to be brought to completion by our own man, who is the organizer and founder of Antarctic land exploration.

We must wait for the story of the great undertaking for a year. But meanwhile we have the details of a most interesting Antarctic voyage after the *Terra Nova* finally left McMurdo sound. Lieut. Evans, R.N., remained on shore to take his share in the travelling, and Lieut. Pennell, R.N., received command of the ship. He took Lieut. Campbell's party with him, of six all told. As they were unable to land at King Edward VII. Land, owing to the perpendicular ice-cliffs, the plan was for the party to land as far west of Robertson bay as possible, and make discoveries in that direction. The region is within that Victoria Quadrant from 180° to 90° E., which was assigned to Scott by agreement with the Germans, who undertook the Enderby and Weddell Quadrants. This has been officially announced on several occasions. Other explorers are of course welcome to co-operate in this or any other direction.

Lieut. Pennell is a scientific officer of high attainments. He obtained his lieutenant's commission for meritorious examinations, is a navigator for first-class ships, clever, methodical, untiring at his work, popular, and modest. As captain he always passed his nights on the bridge throughout the coldest weather, and was most efficient.

On arriving off Cape Adare early in February, a strong gale forced Pennell to heave to, and the gale drifted the ship no less than 100 miles during the three days that it continued. Finally Pennell made the north coast of Victoria Land near Smith inlet, and though that opening could not be reached, the entrance was made out. He then succeeded in running the *Terra Nova* inside the pack, about 2 miles off the shore, as far as Robertson bay, yet in all that 60 miles of coast, from Smith inlet to Robertson bay, there was not a single spot where a party could land, all sheer ice-cliff. Campbell and his party, therefore, landed at Cape Adare. Campbell's companions are Dr. Levick, the geologist Priestley, and three excellent men of the Royal Navy, Abbott, Browning, and Dickason. The danger of their journey westward is that water may form right up to the cliff before they can return. This danger may be overcome when faced by an inventive leader. Campbell is an expert ski runner, and a man of expedients. He may adopt our plan of turning a sledge into a boat, or Mikkelsen's plan, or one of his own aided by a boat on runners. If he forms a depôt at Smith inlet, he might get far beyond Cape North, and make valuable geographical discoveries.

Lieut. Pennell, after landing Campbell's party, had a most interesting cruise in the sea to the west of Cape North, in spite of dull weather and much pack-ice. He discovered new land to the westward in two places, which is of extreme interest with reference to the solution of an important geographical problem. The soundings will also be of great value. By incessant watchfulness and skilful navigation Pennell got clear of the pack by March 8, and from the 21st a south-west gale took the *Terra Nova* to Stewart island.

The problem to be solved is whether the land seen by Balleny in 1839, and by Dumont d'Urville and Wilkes in 1840, is the north coast of Victoria Land, or whether it is a chain of islands with an intervening sea, as Sir James Ross was inclined to believe. This may be discovered by researches westward of Cape North, and by a careful examination of ice movements, their direction, and extent. If there is a continuous coast-line from Cape North to Adelie Land, the ice conditions will be very different from those that will prevail if an open sea intervenes between those two points.

I hope that Lieut. Pennell may favour us with a more detailed account of his discoveries to the westward of Cape North.

THE AUSTRALASIAN ANTARCTIC EXPEDITION.*

By Dr. DOUGLAS MAWSON.

AUSTRALIA and New Zealand have always been anxious for further knowledge of the great frozen continent lying to the southward of them. From the earliest times the heartiest of receptions has been tendered to visiting expeditions, either foreign or British. The resources of these young countries have, however, been so taxed with the expense of explorations conducted within their own borders and the neighbouring islands, that the large sum of money required for Antarctic research has never, in the past, been forthcoming. There have been, nevertheless, amongst us ardent advocates of this work, amongst whom I may mention the name of Mr. du Faur, of the New South Wales branch of the Geographical Society. This gentleman has urged the importance of this subject for over thirty years. The recent British Antarctic expeditions have been warmly welcomed, and their funds generously supplemented. The results have been regarded as eminently satisfactory.

Because the Ross sea area is more conveniently situated to the south geographical pole, most expeditions to the Australian quadrant have wintered there. This has led to the neglect of the great coast-line westward of Cape Adare. Our information regarding it is very fragmentary, and for the most part unreliable. Properly equipped, an expedition to

* Royal Geographical Society, April 10, 1911. Map, p. 700.

this region should have no difficulty in achieving great geographical successes. That the ill-found sailing ships of Wilkes, D'Urville, and Balleny achieved a considerable measure of success is evidence enough of the practicability of navigation along this coast-line. Finally, in the words of Dr. H. R. Mill, "It is time, at any rate, that some one should revisit the lands discovered by Biscoe, Balleny, D'Urville, and Wilkes. . . ." *

Lying within wireless telegraphic distance of our borders, this region has a special call upon Australasians. Alive to the value of scientific data there massed, waiting to be collected, I have ardently sought for an opportunity to reap the harvest. Captain Scott's programme was too full with the determined efforts in view, upon the south geographical pole and King Edward VII. Land, for him to accede to my request to be landed this year with a party at Cape Adare. It was then that Sir Ernest Shackleton proposed to raise the necessary funds, and, with myself in charge of the scientific work, to attack the whole coast-line between Cape Adare and Gaussberg. The plans were published in the press on March 19, 1910, and repeated later in the year. Eventually Sir Ernest Shackleton handed over the command to me.

The enthusiasm with which Australia and New Zealand have always followed Antarctic research, and their growing resources, led me to decide upon an expedition at least chiefly supported by those colonies. I placed my plans before the Australasian Association for the Advancement of Science on January 12 this year. In replying to my address, the President of the Association, Prof. Orme Masson, said—

"Ours is an Association for the Advancement of Science—in other words, the increase of knowledge; and surely there is no knowledge which has a prior claim on men's attention than the knowledge of their own Earth. There is no more fascinating scientific inquiry than one which seeks to increase this knowledge; and perhaps—and this would appeal to Dr. Mawson—this was so for the reason that there was always a little danger in it.

"Further, this is a proposal for the organization of an expedition which will be peculiarly Australasian; and because we are part of the British nation, which has always taken such a leading part in geographical discovery, and because we happen to be that section of the British nation which rests nearest to the proposed field of investigation, it is surely—if I may use an Australian phrase which is rather expressive—it is surely 'up to us' to assist."

The association then placed a hallmark upon my project by unanimously voting a sum of £1000 towards it, this amount being one-third of their total assets. A committee of about twenty-five of the leading scientists of Australasia, interested in the subjects involved, was then appointed to assist in the organization, and to approach their respective

* 'The Siege of the South Pole.' London, 1905.

State Governments for funds. The chairman of the committee is the president of the association, Prof. Orme Masson, who will be succeeded shortly by Prof. T. W. E. David.

The exigencies of the equipment and the need of further support then brought me to London, and I am given this opportunity of personally explaining our propaganda to those who are perhaps best able to assist us with advice. Before elaborating our proposed scheme of attack, I shall hastily review the history of Antarctic exploration as detailed in Dr. Mill's valuable contribution, 'The Siege of the South Pole.' For its more rapid comprehension I shall make use of an illustrative method of my own, involving the removal of successive sheets from the face of the map corresponding with the discoveries detailed.

To sum up the history of South Polar exploration thus illustrated, it appears that until the last fifteen years, though touched upon as early as 1820, only about seven expeditions, excepting whalers in the areas south of America, have come within sight of the continent. It was not until 1898 that the first Antarctic night had been experienced; even to the present day but four expeditions have wintered on the continent, and their contributions refer only to isolated spots of the 8000 miles, more or less, of coast-line. It is gratifying to note the successes which have attended recent assaults upon the unknown, and we can confidently look forward to the unravelling of the broader geographical features of the yet unknown Antarctic regions within the next few years. Our present knowledge of the southern extremity of our globe is but sketchy, as indicated by the following remarks.

The Antarctic Continent.

Conclusions of any but local value based on the data available are obviously liable to prove in error, but will serve a useful purpose in directing the attention of explorers to possible contingencies. The inadequacy of the data available is comprehended when we find, founded upon them, several entirely different views regarding the geomorphology of the South Polar region. There is, nevertheless, a general agreement regarding the seaward limits of the land and the permanently attached ice. That is to say, we can now guess approximately the limits of southward navigation—where ships must be brought up either by land or barrier ice. Assuredly considerable portions of this coast-line are no more than barrier ice — marginal shelf-ice of great thickness—which in the recent past may have been of greater seaward extent, and in the future may retreat even hundreds of miles before the rocky coast-line is revealed. These barriers originated from the land glaciers, and are partly aground, partly afloat. It appears probable that the immense thickness of nearly 2000 feet is sometimes reached. In such cases the barrier ice, though afloat, plays the *rôle* of land, and is charted as the margin of the continent.

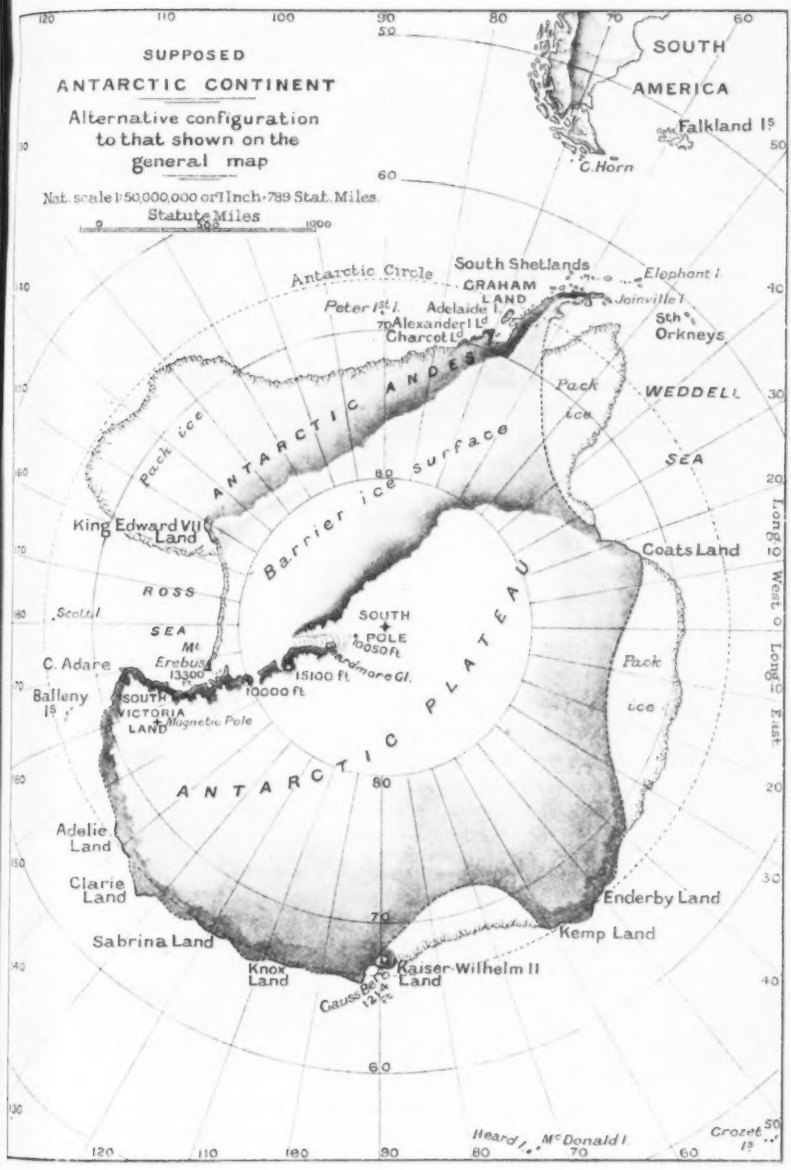
Concerning the topography of the interior, all is speculation except in the vicinity of Captain Scott's and Sir Ernest Shackleton's exploits.

Thus it is that some hold the view of a continuous high land from Graham Land to South Victoria Land—a continuation of the Andean chain; others regard the possibility of a great trough-subsidence, continuous from the Ross sea to the Weddell sea, isolating an eastern and a western Antarctica. Yet another view is that Enderby Land is part of a third isolated mass. There are many grounds in support of the existence of a trough between the Victoria Land massif and the Andean continuation of Graham Land. Granted its existence, it will be still uncertain whether this depression sinks below sea-level, or is merely a topographical feature of the land. The existence of a passage below sea-level appears to me quite unlikely. Nordenskjöld and Gunnar Andersson have shown how the highlands of Graham Land must be regarded as a continuation of the Andes. Possibly, further to the westward, this folding has been responsible for land trending towards King Edward VII. Land, the presence of which has been inferred by Charcot, and has not participated in the piling up of the mighty ranges of South Victoria Land which girdle the south geographic pole.

The recent British expeditions have shown that the present topography of South Victoria Land is due to elevation *en bloc*, associated with which appears to be but little of the folding typical of the Andes and Graham Land. This dissimilarity in tectonic features rather suggests that the views entertained in the preceding paragraph may prove to be correct.

The dynamics that have effected the land-building of Tasmania and Eastern Australia, correspond more strictly with those whose sequence is illustrated in the plateau massive of South Victoria Land; on the other hand, New Zealand and the archipelagoes of the adjacent Pacific ocean are illustrations of the Andean tectonics in the Australasian region. This lends colour to the view that the Graham Land chain, isolated from the plateau area by the trough referred to, extends through King Edward VII. Land and below the ocean waters to New Zealand. This is illustrated in the sketch-map. The probability of this barrier-ice channel, between the Weddell and Ross seas, has led Lieut. Filchner to organize a German expedition to investigate the subject.

Quite another view, and the more likely in the light of our present knowledge, is that the Antarctic continent is a single unit, its dominant feature being a high range of mountains, continuous from Cape Adare to Graham Land, reaching elevations of as much as 15,000 feet. Extending from this range towards the Atlantic and Pacific oceans can be nothing but a vast, lofty plateau, a large portion of which is known to reach a height of over 10,000 feet, and little is likely to extend below 6000 feet. It appears to slope more gradually on the Atlantic ocean and Indian ocean margins than on the Pacific side, where there is a sudden and precipitous


SUPPOSED
ANTARCTIC CONTINENT
Alternative configuration to that shown on the general map
Nat. scale 1:50,000,000 or 1 Inch = 789 Stat. Miles
Statute Miles
SOUTH AMERICA
Falkland Is
C. Horn
Antarctic Circle
South Shetlands
GRAHAM LAND
Elephant I.
Joinville I.
Peter Ist I.
Adelaide I.
Alexander I Ld
Charcot Ld
Sth Orkneys
ANTARCTIC ANDES
Pack ice
WEDDELL SEA
Barrier ice surface
King Edward VII Land
Coats Land
ROSS SEA
Scott I.
SOUTH POLE
9050 Ft.
Mt Erebus 13300
15100 Ft.
Shackleton Gl.
C. Adare
Balleny Is
SOUTH VICTORIA LAND
Magnetic Pole
10000 Ft.
ANTARCTIC PLATEAU
Adelie Land
Clarie Land
Sabrina Land
Knox Land
Kaiser Wilhelm II Land
Gauss Berg 1230 Ft.
Enderby Land
Kemp Land
Heard I.
Mc Donald I.
Crozet Is
Long. West
Long. East

scarp; between this latter and the open ocean is a large area of barrier-ice in which are either island archipelagoes or, maybe, undulating lower land arising as offshoots from the main orographic line. These ideas are embodied in the folding map accompanying this paper.

Between Gaussberg and Graham Land, on the Atlantic ocean side, it is likely that most of the sea-front will be found to be occupied by barrier ice; Enderby and Kemp lands, therefore, may be no more than islands.

The consanguinity of the lavas of Gaussberg and the Ross sea downthrow-area is suggestive of a similar indentation of the continent between Wilkes' Termination Land and Kemp Land. According to this view, the Antarctic continent has an area of somewhat over 5,000,000 square miles, the major part of which is a plateau of great height. The general outline resembles an inverted South America. Undoubtedly the main land mass of the Antarctic regions lies in the Australian Quadrant. This has been independently arrived at from theoretical considerations by Mr. E. A. Reeves,* who has discussed the subject of distribution of land and sea as judged by the deflection of the lines of magnetic force. Until properly explored, great doubt must remain as to what land really exists in the vicinity of King Edward VII. Land and southward. I am of the opinion that no passage extends between the Ross and Weddell seas, and that any land in the direction of King Edward VII. Land will prove to be subsidiary to the main mountain cordillera figured in the folding map.

Glimpses only of the past history of Antarctica are yet known—fragments gleaned from the analysis of scientific data to hand. We know that there were periods when ice was almost unknown, when great formations of water-deposited beds accumulated, associated with coal-bearing strata; these beds have their exact prototypes in Tasmania—in fact, where Tasmania leaves off South Victoria Land begins. We believe that in not long geologically remote times the intervening 1500 miles became engulfed; this conclusion is arrived at by an entirely separate line of argument, proceeding from the evidence supplied by fossil and living forms of life.

Australian and New Zealand types show a remarkable affinity with those of South America and South Africa. This striking similarity in variety and range is exemplified not only in the bird life and mammalia, but also in most fresh-water and marine animals. The similarity extends to the flora also. To the casual observer the connection is most noticeable in regard to the birds and mammals. We find parrots and struthious birds of the ostrich type common in these southern lands. "Considering the marsupial mammalia, such occur at the present day in the Australian region and in Central and South America. Of

* *The Geographical Journal*, 1905.

the two sub-orders, Polyprotodontia and Diprotodontia, into which the marsupialia are divided, the Diprotodontia, which are the more primitive, are essentially Australian, as shown by the abundance of their fossil remains. The fact, however, that a representative of this class is now living in South America is strong evidence of a land connection, unless an independent and convergent process of evolution is regarded as possible. Further, the fossil evidence is absolutely in favour of a continuity between South America and Australia—as, for instance, may be mentioned amongst the extinct marsupial fauna of Patagonia, the Prothylacinus, which is essentially identical with the Tasmanian tiger. All this evidence confirms the theory of connection between the southern lands by way of Antarctica.

"On the other hand, there is no line of argument founded on fact which can be urged to support the view of immigration by way of Asia. Suppose, for instance, that the marsupial fauna had come to Australia from Asia; then we should expect to find the types most numerous and most generalized in Northern Australia and Asia. Identically opposite is the case, and in the whole of Asia no living or fossil marsupial has ever been found." *

The evidence is conclusive, therefore, in the minds of scientific men, that in the not long (geologically) past there existed a habitable Antarctic continent with rays stretching up to meet with what are now Tasmania, South America, New Zealand, and South Africa. With regard to the relative epochs at which these countries became severed from the southern continent, the evidence shows that that with South Africa was the earliest and loosest. New Zealand, though possessing many of the features of Antarctic flora and fauna, never received a marsupial population, and its final separation is thereby allocated to the early Tertiary times. Australia, then separated by the formation of Bass strait, and more recently Tasmania and South America, have become isolated by the engulfment, due to diastrophism, of the land bridges connecting both with the Antarctic continent.

Much of the strata of Southern Australia are composed of the *débris* of this lost land. To the south of Australia, where now is ocean, were highlands, providing an abundance of material shed northward into what were then lowlands and marine areas. Volcanic activity on a large scale, remaining even to the present day in isolated spots, attended the separation of these land masses. Finally, an ice age of almost unprecedented severity creeping upon the Earth overwhelmed the residual Antarctic continent, and swept every trace of life into the southern ocean.

These glimpses of the Antarctic continent, and its history, illustrate how little is yet revealed of the wealth of scientific data locked up within its icy ramparts, and calls for the united efforts of scientific bodies

* 'A Naturalist in Tasmania.' Geoffrey Smith. Oxford: 1909.

throughout the world to banish this ignorance, which stands as a reproach in this enlightened twentieth century.

The Plans of the Australasian Expedition.

These remain the same as published over a year ago, except in so far as modification may be deemed advisable, due to exigencies arising from the deficiency of funds, or unforeseen circumstances. Briefly, we hope to have a complement of fifty men—ship and land party—and proceed south from Australia about the close of this year. Practically every member of the land party will be a specialist in a particular branch of science. Most of the recruiting will be amongst the graduates of the universities of Australia and New Zealand.

The ship and much of the equipment is being procured in London. Captain J. K. Davis, commander of the *Nimrod* during the latter part of the Shackleton Expedition, will be master of the ship. Davis has had great experience in sailing vessels, which specially fits him for the work. In his homeward journey with the *Nimrod* he holds the record for winter navigation in a higher southern latitude than ever accomplished by any other vessel. Proceeding south from Australia, we intend to land at intervals three separate shore parties, each equipped with the necessities for wintering.

It had been our intention of dropping a few men at Cape Adare, for that is the easiest and most accessible landing on the Antarctic continent. The facilities there afforded of coal and stores left by Borchgrevink's expedition would have further simplified matters. In the light of recent events, this must be eliminated from our programme. It is our special desire to accomplish a complete geographical and magnetic survey between Cape Adare and Gaussberg, a distance of over 2000 miles. This will be effected by sledging parties proceeding along the coast on either hand from the wintering stations. At least one inland party will be despatched—that to the magnetic pole, coming in on it from the opposite direction to the approach made by our party on the Shackleton expedition. By this journey we hope to complete the magnetic data yet wanting in the vicinity of the south magnetic pole.

This portion of the Antarctic continent, to which our efforts are to be directed, is regarded as by far the most important portion of the continent yet to be explored. Along the whole 2000 miles of coast between Cape Adare and Gaussberg a landing has been made once only, and then but for a few hours, by D'Urville's expedition in 1840. Only few vessels have ever come within sight of this coast, and practically none since the days of D'Urville and Wilkes. We desire to receive authority to raise the Union Jack and take possession of this land for the British Empire.

The sledging journeys will be accomplished by man hauling, dog-teams, and motor sledges. Sledging over sea ice in the early spring may

be possible; such journeys would be accomplished with seal meat and blubber as food, collected *en route*. Scientific knowledge of this area is entirely wanting.

The magnetic charting will be of value to navigation. The want of geological data from there is keenly felt, especially in Australia, where there is a dependence of the local geology upon that of Antarctica. Biological researches must be rich in new discoveries; it may be that there is the habitat of some of the rare types of seals and Antarctic birds. Certainly the southern ocean, in that vicinity, abounds in whale and seal life, and if we can establish convenient harbours or discover sub-Antarctic islands there is sure to follow commercial enterprise on these lines.

The meteorology of this area is very important in connection with shipping along the southern coast of Australia and New Zealand. It is thought that the erection there of a wireless weather station will be of very great service in connection with Australasian weather reports.

In putting ashore the landing parties the ship will coast along from east to west, continuing to explore the continent towards Africa after dropping the last party. An effort will be made to discover whether a deep gulf does exist to the west of Gaussberg. Driven northward by the advent of autumn, the ship will proceed to Australia under sail by the route shown in the accompanying map.

The winter will be spent in oceanographic work on the lines adopted by the Prince of Monaco. Deep-sea trawlings from between 500 and 2000 fathoms will be made at intervals in this as yet unexplored southern ocean, and almost every species brought up must be new to science.

The PRESIDENT (before the paper): When opening a meeting dealing with Antarctic exploration, I cannot refrain from expressing the satisfaction which every Fellow of this Society must feel at the safe landing which Captain Scott has made on the Antarctic continent, and at the prosperous beginning of his expedition. I say this, well remembering that he was unable to land his eastern party on King Edward VII. Land, and that, finding a Norwegian expedition already on the Great Barrier, that party landed at Cape Adare. One must remember that it is only in civilized lands where the traveller can reasonably expect to escape all misfortunes; whilst, as for true exploration, its course never does run quite smoothly. These misfortunes are to be regretted, but they do not in the slightest degree dim our confident expectations that Captain Scott will produce splendid scientific results, or shake our hopes of his reaching the Pole. As to the Norwegian expedition, it will be best to say but little about it until we have fuller accounts of their proceedings, both past and future. I am glad, however, to take this opportunity of expressing my own personal opinion that no explorer attains any vested rights merely by exploration, and that we should therefore welcome all foreign scientific competition on the Antarctic continent, wherever it may appear, if information is given in good time in advance. I hope also that cordial relationship will always exist between all Norwegian and British expeditions, as appears in this instance to have been the case. But I cannot refrain from expressing my regret that Captain Amundsen did not give us an opportunity of discussing his Antarctic proposals before he left Europe for the south.

Passing on to the subject of to-night's lecture, Dr. Mawson, the Australian explorer, whom we so cordially welcome, is well known to us all as one of the most valued assistants in Sir Ernest Shackleton's last Antarctic expedition. Dr. Mawson is an Englishman by birth, who left this country early in life for his new home in the Antipodes. He was educated at Sydney University, and in the course of his education, and afterwards, he studied mining engineering, chemistry, and biology, whilst geology has always been his favourite science. With this record, it is evident that there are few men better qualified than he is to lead an Antarctic expedition, and we shall therefore, I am sure, all listen with the greatest interest to his proposed plan of operations.

The PRESIDENT (after the paper): In listening to Dr. Mawson's account of his proposed expedition every one must have been struck at the scientific character of the work he intends to do. Science really means nothing more than knowledge; and, when looking at the map of the southern hemisphere, we see that great continent of Australia and opposite to it another great continent —the Antarctic continent—we cannot feel surprised that the people of Australia are determined that, as far as in them lies, their present ignorance about this other great continent shall cease. Australians are wise from every point of view in endeavouring to hasten the solution of the problems thus raised. Truth should be sought for truth's sake, without any view of the reward, although ample reward will very often unexpectedly be obtained. Dr. Mawson speaks of the possibility of in future erecting a station on the Antarctic continent from which wireless messages to Australia concerning the weather could be sent every day. I believe the cost of such a station might be recovered in a very few years; for Australia will never be able to get any predictions of the general course of the weather for the coming seasons until meteorological stations are established on the Antarctic continent, where daily records of the weather are kept. If it were possible to prophesy a drought in advance, it would be an enormous advantage to Australia from the point of view of agriculture. Dr. Mawson's expedition to the Antarctic will be a step in the right direction, for he will ascertain where stations could be established, and he will also himself be taking valuable meteorological observations. As to his scientific results, I should like to take this opportunity of saying that the Council of this Society are so convinced of their value that we have decided to make a grant of £500 to this expedition. We wish we could do more for him, but I trust that he and his Australian friends will regard this as a token of our good-will and our strong sympathy with him in all his efforts. We are glad to welcome here to-night Sir George Reid, the Commissioner for Australia. I cannot help wishing that in his presence I was able to announce a larger grant, because we in England always look back with the greatest satisfaction to the great help Australia gave to all our British expeditions.

Sir GEORGE REID: I came here from a feeling of admiration I have for the gentleman who has delivered this address. During Sir Ernest Shackleton's expedition, Dr. Mawson was one of the chief men in that most heroic expedition who so nearly achieved the South Pole. Dr. Mawson has talked to us of great things with the stamp of great performances behind his utterances. Those who have read the history of the Shackleton expedition know that there has hardly been an expedition sent down in that direction which endured greater hardships. The worst of it is, that people who believe in these things have not got the money. There is nothing so easy as asking other people to give a thousand or two; I find it is the easiest thing in the world. The Australian Government has helped a number of British expeditions, why should not the British Government help this expedition? I quite admit that, especially

with the affairs of a nation like the British, which has such enormous liabilities, economy is a grand thing; but I think there is even room under the most economical Government for a little grant to be made to this Australian expedition. The Royal Geographical Society has done for Dr. Mawson's expedition a great deal more than the amount—the generous amount considering the calls upon their finances—which they are subscribing to this expedition. The fact that this most distinguished Society, whose fame is held in high esteem throughout the whole of the civilized world, has approved his project ought to strengthen his appeal to the wealthier people, to whom the task of finding the money should not be very great. I want to express, on behalf of the people of Australia, their admiration for this young Australian, and their hope that he will succeed in his great enterprise.

Lord Lamington: For five years I was closely associated with Queensland and Australia, but it was a part of Australia which had not very much to do with the Antarctic. But I think anybody who has been in the Antipodes feels, naturally, that that great continent should do a great deal in the way of exploring in the Antarctic ocean. Our President said he did not know sufficiently whether any material result would follow from the expedition that Dr. Mawson is going to undertake, but he did mention the fact of the great benefit which might result from the establishment of a wireless telegraph station, and I understand from Dr. Mawson that he does believe there will be great advantages, and material advantages, from the exploration of the mineral wealth that lies in the Antarctic. What appears to trouble Dr. Mawson now far more than the possible or certain hardships that await him, is the difficulty of getting the funds together, but I am confident in ultimate success of the appeal that he has made. The Australians will take too great a pride in such an expedition for one moment to allow it to be impossible for the realization of it on account of money. Whether in work or in play, when they take a matter up they put their whole heart and soul into that project, and this is the case, I think, with Dr. Mawson. His qualifications have been described to us by our President, and the way in which he described to us what he hopes to accomplish, and his accurate knowledge of all that may be ascertained by this expedition, I think enforces his arguments that all possible public support ought to be given in furtherance of his object. I hope he will have absolute success in his project.

Sir Ernest Shackleton: I will be very brief. Naturally, Dr. Mawson having been a member of the late expedition that I had the honour to command, it is of great interest to me to see him going again, and I have spoken to him and strongly advised him not to go £35,000 in debt. He is making great efforts not to go like that, and I must say the support given to him by the Royal Geographical Society is of more value than the actual money that is given, because this, the greatest geographical society of the world, the most influential, though it may not have the funds, has the name, and when Dr. Mawson is able to cable to Australia to-morrow that the Royal Geographical Society has given to him the same amount of money that it gave to Captain Scott, it may make Australia look up and take even more interest than it does at present. I feel that as regards Australia, we on this side should do everything possible to help, for Australia has always helped English expeditions. I wish Dr. Mawson, my old comrade, every success in the scientific work he is undertaking. It may not have the glamour of the Pole around it, but it is work that will stand for ever if successfully accomplished. As to Captain Scott, who is away now in the Far South, we, sitting here in comfort to-night, only wish him success in the undertaking he is doing—to plant the Union Jack flag on the geographical south pole. We regret he did not reach King Edward VII. Land,

but there is a lot of work to be done in the Antarctic, as Dr. Mawson has shown us to-night, and we wish him success in the future, and everything he has to do. It is a hard thing to raise funds.

Dr. MILL: All the speakers have laid stress on the importance of securing funds for this expedition, and that, after all, should be the easiest part of it, because there are hundreds, even thousands, of people who are perfectly able to give money, and large sums of money, for such work, but there are very few people indeed who have the qualifications of Dr. Mawson for applying that money to the purpose for which it might be given. For one born explorer who is an enthusiast for his work, there have always been in the past dozens, if not hundreds, of people who have the money, and who can be brought to see that the best use they can make of it is to enable a man like Dr. Mawson to do the special work for which he came into the world. There is no part of the Antarctic area which is so promising for exploration as that which lies nearest to Australia, which Dr. Mawson has determined to explore. Every expedition which has gone along that coast in the right direction made important discoveries, and initiated long controversies; but no steamer has ever attempted seriously to make exploration on that coast, and the first steamer that goes there following the coast as closely as the ice may permit from Cape Adare towards the Gaussberg, is absolutely certain to make great and important discoveries, perhaps also to give rise to new controversies that will stimulate exploration right on throughout the century. My earnest hope is that Dr. Mawson will not start with a programme as large as his own enthusiasm. It would be a great mistake to attempt to do too much on the first expedition, because I hope this first expedition will be such a success that the people of Australasia will refuse to follow the example set by this country of discarding the whole Antarctic machinery after the expedition comes home, and will keep exploration going on until the whole of the mystery of that coast has been definitely cleared up, to the eternal honour of Australasia.

Mr. R. N. RUDMOSE BROWN: At this late hour I do not want to detain you any longer, but I should like to join in the good wishes that have been expressed to Dr. Mawson. I think there is something undeniably heroic in his programme, in that he has left out the pole. Now, the attainment of the pole and the penetration of the interior of the Antarctic is certainly most important, but there is just as good work and as important work to be done by an expedition that does not include the pole in its programme, although of course there is not the same sensational aspect in such a programme, and consequently it will be more difficult to raise the money. I do not want to be held to disparage a southern journey—far from it. It is very important we should reach the pole along many different meridians, but at the same time it is equally important that we should not neglect the outlying regions of the Antarctic, and Dr. Mawson has set a good example in that way—an example which it is high time that geographical societies were able to teach the public was worth following, because it is almost impossible to convince the public that there is anything in polar exploration except the attainment of the pole. I can only express my good wishes and the good wishes of the other members of the Scottish Antarctic expedition, and I am asked by Dr. Bruce to convey his good wishes to Dr. Mawson in his forthcoming expedition. I trust he will not have great difficulties in raising the funds for this very worthy object.

The PRESIDENT: Finally, in the name of every one here present, let me bid Dr. Mawson and his companions God-speed on their arduous journey.

A JOURNEY INTO THE ABOR COUNTRY, 1909.

By Colonel D. M. LUMSDEN, C.B.,* and the late Mr. NOEL WILLIAMSON.

[The following brief and hitherto unpublished account of a visit to the Abor country, made by the late Mr. Noel Williamson and myself in company with the Rev. W. L. B. Jackman, of the American Mission, in January, 1909, may tend to throw some light on the reasons for Mr. Williamson again renewing his visit, and for the trust he placed in the people who have so treacherously murdered him and his fellow-traveller, Dr. Gregorson, with a numerous following.

The object of my visit was to unveil, if possible, the mystery still surrounding the falls of the Tsanpo; but Mr. Williamson's main object, as political officer, was to establish friendly relations with the Bor Abors, while the padre undoubtedly had his mission work at heart. Had Mr. Williamson on his second visit followed the route we then took, no doubt he would have been met once more at Kebang by Maddu gam of Reu and had some excuse made, as was done to us, for preventing him crossing the river. To avoid this, and placing faith in the invitation the Gam of Reu then gave him to return next year and all would be well, he crossed the Dihong lower down and marched for his village, encamping for the night within a few hours of the place. That evening a number of Abors came from the Reu village and offered him presents. This no doubt strengthened his belief that he would be welcomed on arrival, and on getting there next morning and being met by Maddu gam he unhesitatingly followed him to his doom, his trusted servants and followers sharing a similar fate. Poor Dr. Gregorson (whose aims were similar to my own, viz. the falls!), who had to camp further down the river to look after some sick coolies, while attempting to join him, was also killed by the same treacherous gang, as well as those with him.

Some may think that Mr. Williamson was rash in venturing again on the mission he did. But when it is considered how we were received on our previous journey and the invitation given us to return, he cannot be blamed in endeavouring to maintain the friendly relations which were seemingly then established. As a frontier officer, Mr. Williamson at Sadiya was the right man in the right place, and has justly earned the kindly tribute paid to his memory in the last number of your *Journal*. When the time arrives, no doubt the Assam Government (who are the best judges) will take the needful steps to deal with the situation. But I may say, from the close of April to the end of October, Nature's barrier, in the shape of the swollen waters from the melting Himalayan snows, confines the Abors and other tribes along the frontier to their mountain-tops as they do us to the plains below.]

January 25, *Camp on the Dihang River.*—Left Sadiya this morning at

* Colonel D. M. Lumsden's diary of his recent attempt to reach the Tsanpo falls.

7.30, the party consisting of Williamson, myself, and our surveyor, Pertab Singh (kindly lent by Colonel Longe), four Miri *kotokies* (interpreters), and 48 Naga coolies. Including servants, we totalled 111 souls. It is only a mile from the Political Officer's bungalow to the Brahmaputra, where we found eleven dug-out boats with all our belongings on board. We drifted down-stream, passing the mouth of the Debang at 12.30 and reaching our camp on the Dihang two hours later.

January 26, *Camp Sesiri Mukh.*—It is hard and slow work pushing up-stream, and although we got off in good time, did not reach camp until 4.30 p.m.

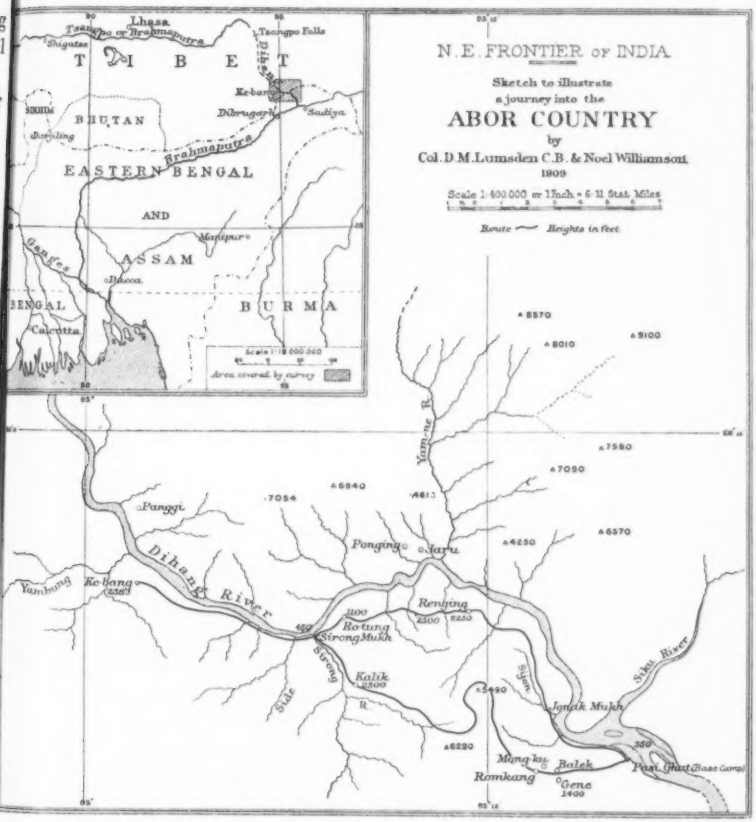
January 27, *Sibiya Mukh.*—Another day's pushing and pulling got our small fleet here by sundown.

January 28, *Pasi Ghat.*—Williamson and self in our small boats reached here (the end of our water transit) by noon. But the others did not put in an appearance until 5 p.m. The rapids were many, and heavily laden boats could make but slow progress. *En route* we passed the camp of the Rev. W. L. B. Jackman of the American Mission, but found him away visiting some of the Miri villages. Williamson had often spoken of asking him to accompany us, he having a perfect knowledge of the Abor dialect, and, with Williamson's permission, already visited two of their lower villages on the Debang river. I was delighted at the suggestion, as, apart from what I have stated, I knew he would be an excellent travelling companion. Unexpected delays kept us at Pasi Ghat, our base camp, until February 5. Meantime, the *padre* had gleefully accepted Williamson's invitation to accompany us, and joined our camp on the evening of the 4th. Like ourselves, he had heard rumours of an inter-tribal war amongst the Abors; but such things being of common occurrence, we paid but little heed to the story. I would here mention that about a mile above our camp the Dihang emerges from the hills, and from the gorge there blows what seems a never-ceasing cold gale. Our marching gear was now cut down to the lowest possible scale, taking but one small tent for the three of us to sleep in.

February 5, *Camp Romkang.*—We got off at 8 a.m. The first 4 miles of our march was quite a level path through the forest and easy walking for our coolies. We then crossed a small stream and were in Abor Land. There is quite a group of villages about here, named as follows: Bokung, Mong-ku, Balek, Gene, Yagrung, Romkang, and we were soon met by several of their *gams* (headmen), who suggested our camping at the nearest village, Balek, saying Romkang was distant from water, etc. Williamson, however, by his *kokoties'* advice, pushed on, getting to where he wanted at 2 p.m. Height 1400 feet. We had soon a gathering of *gams* from every village. Williamson now asked them for guides to show us the way to Ke-bang. This, they said, was impossible. The war, which turned out to be no myth, would render the journey a dangerous one, and they would not be responsible for our safety, etc.

February 6, *Romkang.*—The morning broke dark and gloomy, and our

prospects of getting on seemed equally so. The *gams* were still unanimous in their efforts to dissuade us from advancing. The difficulties of transport and the dangers of the road were added to the war scare. *Apropos* of the latter, we were told that two moons ago the Punggees from the northern bank had raided on their southern neighbours, killing six tribesmen. Now the villages between here and Ke-bang were joining their forces to



retaliate. Still obdurate, close on to noon they made Williamson the present of a pig, which he wisely declined, to show his displeasure at their not agreeing to his request. This rather took them aback, and later in the evening Williamson approached them with the offer of Rs.100, when they began to think the matter over. After consultation, they said that if each village was given Rs.100 they would accede to his request.

This Williamson firmly declined to do, but said he would add another Rs.50 on to his previous offer. This they finally agreed to take. We now endeavoured to get them to assist our coolies in the matter of transport, but beyond getting four men, to whom we paid Rs.4 each for the journey to Ke-bang, we could do no more.

February 7, *Romkang.*—Got an early start 8 a.m. Our march was a stiff one, having to cross the range in front of us at a height of 5650 feet. As we ascended we had several fine views of the Dihang valley, one in particular of the gorge where the river flows into the plains. Our descent on the other side was bad going, steep and slippery, and our coolies being about done, we camped at the first small stream we came to. Height 4500 feet.

February 8.—Start at 8.30 a.m. and continued our downward course. Temperature at leaving registered 38°. On each side of our narrow and winding path the undergrowth had been recently cut to a width of 10 to 12 feet on to a small village named Kalik, containing, some thirty houses. Here we camped for the night. It is situated near the Sirong river. Height 2450 feet. Few of its inhabitants had ever seen a sahib, and the curiosity of men, women, and children knew no limit. Our little tent was continually surrounded, and it was with great difficulty we could keep them outside. They were all keen on Burma *cheroots*, of which, fortunately, I had brought a large supply and was able to gratify their taste.

February 9.—Got off at 8 a.m., and, following the same steep, slippery path, soon came in touch with the Sirong river. From here, however, our march was anything but pleasant, our guides at the finish taking us a couple of miles over slippery boulders, and glad we were when 2 p.m. found us once again on the banks of the Dihang. Two of our coolies had, I regret to say, very nasty falls over the latter portion of our route.

I would add that from the village we had just left, the so-called war-path had been cut throughout the journey. After four days' marching through the gloom of the forest, it was a relief to find one's self once more in sunshine. The outlook, too, was magnificent—Dee-side, or the banks of the Deveron, only on a much grander scale. From the sandy patch on which we stood, there was a gentle slope of some 80 yards to the river; then came a deep blue silent pool nearly 200 yards in breadth, while on its further side the cliffs rose to a height of 50 or 60 feet. Below, it might be some 400 yards, we could both see and hear a rush of water. Later in the afternoon we walked down and found a swift and deep rapid, with a huge upstanding rock in its centre.

At sundown we had a visitor—the *gam* of Ke-bang. He was a tall, bent, aged specimen, and wore for a helmet a metal dish cover, while on his body hung a long sack-like garment of Tibetan texture. He was very polite, and offered to lead us to his village next morning. Then followed a request for rum. This we were able to indulge him in, and wished the old gentleman "good-night."

February 10, *Sirong Mukh.*—Up at 7 a.m. Packed and ready to go,

BASE CAMP AT PASI GHAUT, ON THE DIHONG RIVER.

THE DIHONG RIVER AT SERENG MUKH.

THE DIHONG RIVER BELOW SERENG MUKH.

THE GAM OF KEBANG WHO MET US AT SERENG MUKH AND ESCORTED US TO HIS VILLAGE.

but no *gam*. We waited for nearly an hour, but as he did not appear, Williamson went to his hut and found him slumbering peacefully. He soon woke up and took the lead. The morning was simply ideal, and I longed for a boat and my fishing-rod.

About a mile from camp we found our path blocked by a perpendicular rock quite 20 feet in height. There was no way round as far as we could see, only a steep cliff on one side and deep water the other. This we surmounted by felling a big tree, in which we cut notches, placed it against the rock and scrambled up, our coolies one by one following suit. But worse was to come. Scarcely another mile onward ere we had to feel our way along the edge of a steep precipice, holding on to tufts of grass and with barely a foothold. It was ugly going, as a single false step would have landed you in the pool below—a drop of 50 feet. I was indeed thankful when I saw all our coolies safely over. Only hillmen could have done it with loads on their backs. It took two hours to get the last of them over. Soon after we were again in the gloom of the forest climbing up toward Ke-bang. A steep and weary climb too, and I was far from sorry when 4.30 p.m. ended our day's march. Height 2383 feet.

From the river to the village the so-called war-path had been widened as before. Here the coming strife was again placed prominently before us. At dusk the *gam* of Reu crossed by bamboo raft (the only mode of water conveyance in these parts) and entered the village. He said he had been forewarned of our coming, and asked us to visit him. This was decidedly cheering, and pleased us immensely. He was, we were told, a man of much importance, namely, the minister of war. Both he and his attendant wore tall round hats made of *sambhur* skin and long coats also of Tibetan texture. He soon gathered an audience around him, and spoke for quite an hour. He had a short beard and moustache, held a spear in his left hand, gesticulating throughout with his right, and frequently pointing towards the enemies' country. Darkness ended his harangue to the villagers. Then came a select gathering of *gams*, but held out of ear-shot of our *padre* and Miri interpreters.

Early in the morning of the 11th we were again approached by the minister of war, but this time with quite another story. He now agreed with the eight *gams* who had accompanied us as guides from the villages before named, that for us to cross the river and proceed onwards in the present unsettled state of the country would be very dangerous; that he himself would be away on the war-path and unable to look after and assist us, ending by asking us to come back next year, when all would be well. "Yes," as the *padre* quaintly remarked, "next year if there is no war, sickness will probably be the excuse." However, in spite of all, we were still hopeful and continued to make various offers both in money and presents. We now trotted out the gramophone, placing it at some distance from our tent so as to give us some breathing space. "Harry Lauder" was soon in great request, his Laughing Song being continually encored. The great

difficulty was to keep the surging crowd from handling the instrument. Towards evening the *padre* and I took a stroll through the village, which they seemed very proud of and keen to show us, especially from the high range of houses which looked down on the river and the valley beyond. The view from here was magnificent.

February 12.—An early audience before we were out of our beds, the medicine chest being in great request. This the good *padre* took under his care and no small task either. We had brought a large stock of useful stuff with us, skin diseases and eye-sores being very prevalent, while many suffered from goitre. Quinine, too, was much sought after. Towards noon we learned from our *kotokies* that the war minister had gone back to Reu early in the morning, also that 200 of the braves had crossed the river on bamboo rafts at daybreak, and were off on the war-path. This showed us that a forward move from here as things stood was hopeless, so we reluctantly made up our minds to retrace our steps next morning.

During the afternoon the *padre* and I walked to the northern inlet to the village, and found the path strongly palisaded with bamboos. At the entrance gate we met several men from a village beyond. They wore no clothes beyond a small apron of grass hanging behind them. They had a long chat with the *padre*, telling him they were going to join the fighting force. Like all the others, they were much impressed at hearing a white man talk their language. On our return we found poor Williamson simply hidden by a crowd of men, women, and children clamouring for presents and shouting for the gramophone and more medicine. He and I moved the gramophone to some distance, took the crowd with us, and left the medicine-seekers to the *padre*. When darkness fell Williamson gave them a magic lantern show. This amused and interested many of them, but some were frightened, looked and bolted. Next morning, the 13th, we were on the downward track by 10 a.m. Before leaving we made a final distribution of presents, consisting mostly of needles and coloured thread. These were in great request, and the struggle to get them out of our hands was most amusing, the women being the worst scramblers. I omitted to mention that, when we entered the village, there was a dead young pig suspended over the gate—this to protect them against any sickness we might bring with us—an offering to the spirits of evil. On leaving, we were again treated to another phase of demon worship. The young men of the village followed us for nearly 2 miles, throwing tiny shreds of bamboo at and over us. This to ensure us taking the evil spirits with us.

Prior to leaving, our *kotokies* learned that the path we came by from Sirong Mukh on the 10th was not the right one, and we were now being taken by another. This took us by an easy march to our previous camping site, and avoided all the dangers of our upward journey. Here we spent the night of the 13th, as well as the day and night of the 14th. The spot was a lovely one, and we all wanted a peaceful day.

THE GAM OF BEU AND HIS A.D.C. WITH OUR INTERPRETER.

ABOR WARRIORS ON THE WAR PATH.

THE GAM OF REU ADDRESSING THE VILLAGERS AT KEBANG.

February 15.—Started by a down-river path and then struck upwards through the forest, getting to a small village called Renging about 3 p.m. Here we camped and gave the villagers a treat on the gramophone.

February 16.—Left at 8.30 a.m., Williamson not feeling fit and suffering from a nasty cough which had been troubling him for some days. Our march was a very stiff one until noon, when we struck the Sijon river. This we followed for an hour until we made a close approach to the banks of the Dihong. As Williamson was feeling worse, we decided to camp in the shelter of the forest. Fortunately we did so, as he was now expectorating blood. We also sent off word to Pasi Ghat to send up as quickly as possible three of our smallest boats.

February 17, 9 a.m.—Williamson worse and matter looking serious. Luckily the boats arrived at 11 o'clock, and we were able to carry him down to where they were lying about a mile distant. It was a dangerous game to risk boating down the rapids to Pasi Ghat, but something had to be done. We were all nearly upset in the last rapid, but luckily just got through.

February 18, *Pasi Ghat.*—Rested here to-day, Williamson feeling little better.

February 19.—Got Williamson and his camp-bed safely into the boat and left at 8 a.m. for Dibrugarh. Had to stay one night *en route*, pushing on as we did till dusk.

February 20.—I started at daybreak ahead of the *padre* and Williamson to secure the doctor and get him to meet Williamson on arrival. I reached Dibrugarh at noon, and fortunately found Major Leventon in the station, the *padre* and Williamson arriving three hours later. They were met by Major Leventon, who had Williamson taken to his bungalow. The doctor said he was suffering from acute pneumonia, and his case a most serious one.

I waited in Dibrugarh until the 28th, when the doctor pronounced him practically out of danger, although for some time to come, he said, he would require to take very great care of himself. He also added that, had we not returned when we did, Williamson must have succumbed in the jungle, so after all it was very fortunate we had to turn back at Ke-bang.

Conclusions drawn from our Tour to Ke-bang.

We were blocked at Ke-bang, but by passive resistance only. On this occasion they had a valid excuse for their conduct, namely, their war. Leading us too by the most difficult parts they could, throughout our journey, showed us they were none too keen to facilitate our movements. For instance (as we afterwards discovered), the old *gam* of Ke-bang, when he faced us with a rock and the precipice *en route* to his village, slipped quietly away by another path, the entrance to which he had hidden by cutting down branches of trees.

There are two ways by which the Dihong river might be explored:—

(*a*) Say the party consisted of two sahibs and a native surveyor, with twenty picked carriers and two or three light canvas boats. A company on this scale should stick by the river and follow its course the entire way, using the boats to cross from one side to the other as necessity arose.

As far as I have seen, in nearly every place where there is a precipitous bank on one side, the opposite is sloping and offers a reasonably good path. If in places the party could proceed along neither bank, it would be comparatively easy to cut a way through the forest, carry your belongings with you, and rejoin the river when opportunity permitted. Proceeding as above, the day's march could be made long or short as desired, there being always water and a good camping-ground at hand. The want of both of these necessities caused us considerable trouble on several occasions on our upward march. Villages too could be visited when desired, and food stuffs bought or bartered for. They could also be desirably avoided at times and save dealing out the usual quantity of presents which they are continually on the lookout for. With only twenty coolies as carriers, presents would have to be reserved for state occasions and when necessity demanded only.

Regarding presents, we find coloured thread and needles in great request, while with the elder generation a little rum was ever welcome. Medicines too were always in great demand. But for any little service rendered, such as carrying your gun, etc., they had no hesitation in asking for Rs.2 or Rs.3 *baksheesh*.

(*b*) By taking, say, 200 coolies and a force of native troops sufficient to guard them on their marches to and from your base of supplies, *i.e.* should the country happen to be in the state we found it. If at peace and they made no objection to the movement, a military force might be dispensed with. With such a force of carriers and sticking to the native paths and villages as we did, would necessitate taking most of the supplies for coolies as well as the rest of the party from the plains, as it would be practically impossible to procure the needful amount of rice in the country.

Beyond intense curiosity, common to both sexes (which got rather boresome at times), we found the Abor much easier to handle than we expected. But travelling with two such diplomats as Williamson and the *padre* made the path an easy one, and no doubt smoothed over many things which might otherwise have proved stumblingblocks and stopped our tour at the start. Williamson himself has a fair knowledge of the Abor tongue, while the *padre* speaks it like one of themselves.

We found the country almost void of bird or animal life. Scarcely did we see a butterfly, while pig, judging from the number of skulls hanging in the guest-houses and placed over the graves of the Abors who killed them, must be fairly numerous. Tame mithon abound in every village, but we came across no wild ones in the jungle.

In conclusion, if little has been achieved, a good deal has been done to pave the way for the next attempt.

A JOURNEY FROM ANGORA TO EREGLI BY KAISARIE.*

By R. CAMPBELL THOMPSON, M.A., F.S.A., F.R.G.S., F.R.A.I.

On August 20, 1909, my friend Joseph Weissberger and I left Angora, with a caravan of five horses, to work eastwards towards Boghaz Keui, the ancient Hittite capital. Here my friend's leave gave out, and he left me, returning home by Amasia to Trebizonde, while I continued by Kaisarie to Eregli. As the archæological side of our journey is published in the *Proceedings* of the Society of Biblical Archæology (June, 1910, p, 181), I shall deal only with the more geographical points.

The map which accompanies this paper was made with a sextant, a large prismatic compass, and an improvised plane-table. There were, however, few opportunities for using the latter, and consequently the sextant was of the greatest help in checking the compass work. By working in long zigzags, or making the route directly north and south as much as possible, we were able to control in some measure the unavoidable errors of the prismatic compass.

The following latitudes were obtained with the sextant :—

	°	′	″
Elma Dagh top (not a good observation)	39	49	47
Top of hill near Ismail Dagh, west of Hajjilar on the left bank of the Kizil Irmak (see map)	39	46	38
Euyuk (300 yards north of mound and village)	40	14	44
Erkekli (tumulus about 1 mile north-west of village)	39	41	2
Ali Dagh (by Kaisarie : the most eastern cone of the three)	38	42	16
Everek (khan near west end of the town)	38	23	7
Eregli (khan)	37	30	34

The variation of the compass was obtained from an azimuth at Everek, where the magnetic bearing of a point $54\frac{1}{8}°$ E. was made to be 57° 27′ 29″ by the sextant.

Our first ten days were spent in mapping the course of the Chikurjak between Sulimanle and Kilishler, and after that, the Kizil Irmak between Yashan and Cheshme Keupri (Keupri Keui), as both of these rivers are represented by dotted lines on Kiepert's map. The road from Angora is only a track, crossing the great mass of the Elma Dagh to the north-east of the peak, and thence past Tekye Keui across the great basin on the far side, and through the Gôk gorge, which is chiefly of black rock or serpentine. Here, in an undulating valley, broad towards the south-west, and narrowing to ravines at the north-eastern end, the Chikurjak runs to join the Kizil Irmak below Kilishler. Opposite Sulimanle it is called the Balaban Ozü,

* Map, p. 700.

and here are broad marshes inhabited by duck, plover, and snipe; it is a wandering little stream of muddy water. Ultimately, by following its course through the defiles at the lower end of the valley, one reaches Kilishler, and thence crosses the Kura range by the zigzag hill road to the Kizil Irmak. North of Cheshme Keupri for a short distance is a magnificent gorge of syenite, with a cataract. The river appears to be fordable in most places in summer; the banks are from 30 to 50 yards apart, and the water, as the name Kizil Irmak implies, is a tawny red.

After examining an ancient hill fort on the left bank opposite Cheshme Keupri, we moved up to Denek Maden, a well-built town in the hills, near which, an hour or two distant, lie the ancient lead mines which are now being worked again. These hills are covered with dwarf oak scrub, particularly fragrant when cut and bound in faggots; it forms the staple fuel for the hillman, just as sun-dried cowdung serves the dwellers in the plains.

From here we made our way down the rugged spurs of the Denek Dagh to Azzeddin, and thence down part of the Delije Su to Alembali, and then by the Eigar Dagh to Boghaz Keui. So much of this route appeared to be uncertain, that it was well worth mapping; and here the varied scenery of the low channelled and fluted spurs of the Delije valley, of red conglomerate and detrited alluvial matter, was contrasted with the splended ruggedness of the mountains. Boghaz Keui, the ancient Hittite city, where Dr. Winckler has been excavating, is now famous chiefly for the great *trouvaille* of cuneiform tablets discovered there by this *savant*; but as it has been described in many publications elsewhere, there is no need of repetition here. Euyuk, another Hittite mound, lay next on our route, and here my friend's path diverged from mine, and he set off homewards.

From here to Alâja the path lies over undulating spurs, crossing the Balik Chai at that village; after this, the direct path to Yozgad passes through winding gorges. From Yozgad I continued directly south to Erkekli and Ajemi, by a route unmarked on Kiepert's map, and at the latter place lighted on a prehistoric village of hut-circles extending for a mile or two along a small rivulet. As elsewhere in this country, the tops of the downs are dotted with tumuli, and it might be well worth while to excavate to learn the condition of the primitive inhabitants. Incidentally, I was only able to find a few stone implements during the whole journey; two came from Uzal, half a day's journey from Angora, and two from the Soghanle Dere.

From Ajemi to the Konak Su the track lies down a sandy ravine, which debouches into undulating slopes until the river is crossed by a good bridge. On the other side is a steep hill, round the flank of which the road runs, parallel to the Aje Su, which now joins the Konak Su. From the crest the terrain of the Aje Su valley appears flat and undulating, and for the most part barren; the little river flows down a wide dale, where large herds of cattle pasture on the grass of its borders. While we

were at Boghazlian a thunderstorm caused it to rise and flood its marshy banks.

We left Boghazlian, a fairly large but dirty village, to cross the eastern end of the Malya Cheullu, a tableland skirted by rugged hills and dotted with a few villages; the unexpected ravines which intersect it are startling in their abruptness. Ismail Tepe, a striking peak at the south-eastern limit of this plain, is a landmark visible and distinct for fifty miles round, and we passed under its summit on the northern side on our route to Kaisarieh. Here at Talas, under the towering mass of Erjias D. (Argæus), Dr. Dodd and his wife bid me welcome to their house, the hospital, which contains forty beds, open to Moslem and Christian alike. The peak of Argæus is said to be visible on a clear day from the Soluk Dagh to the north, and Eregli on the south, approximately 100 miles either way.

South-west of Argæus lies a great flat plain, roughly 20 miles across, girt by mountains. The road to Eregli lies direct from the western side of this cup through the defile of the Hassan Dagh and Uch Kapili Dagh at Nigde, where it debouches into another great plain flanked on the south by the rugged and difficult Taurus mountains. Our route lay across the slopes of Argæus by Kizil Ören to Injesu, Bogcha, and Urgub, south of which, on an unexplored route at Tamsa, we came upon a large mediæval building, with a striking ornamental *façade*. From here we proceeded to Develi Kara Hissar and Yahyale, and thence back by Everek to the Hittite sculptures at Feraktin. Rumour of antiquities on an unexplored route in the hills to Yeni Keui led us round that way, but the results were disappointing, as they turned out to be the usual rock dwellings with sculptured fronts. Yeni Keui is, however, situated in one of the most beautiful spots that we passed. Thence we crossed the Zamanti Su, and so again across the southern Argæus plain by the well-known route to Eregli.

THE DISTRIBUTION OF EARLY CIVILIZATION IN NORTHERN GREECE.*

By A. J. B. WACE and M. S. THOMPSON.

For the purposes of historical geography the range of Pindus, which, starting far up in the Macedonian mountains, ends in the Parnassus group on the Corinthian gulf, divides Northern Greece into two parts. To the west in Epirus and Ætolia the whole country is a confused mass of rugged mountains, with here and there a lake in a small plain as at Yannina, and below Thermos (Kephalovriso). The principal rivers, such as the Achelous and Arachthus (the river of Arta), run through narrow defiles, except near their mouths. The main route from north to south seems to have come down central

* Research Department, January 19, 1911.

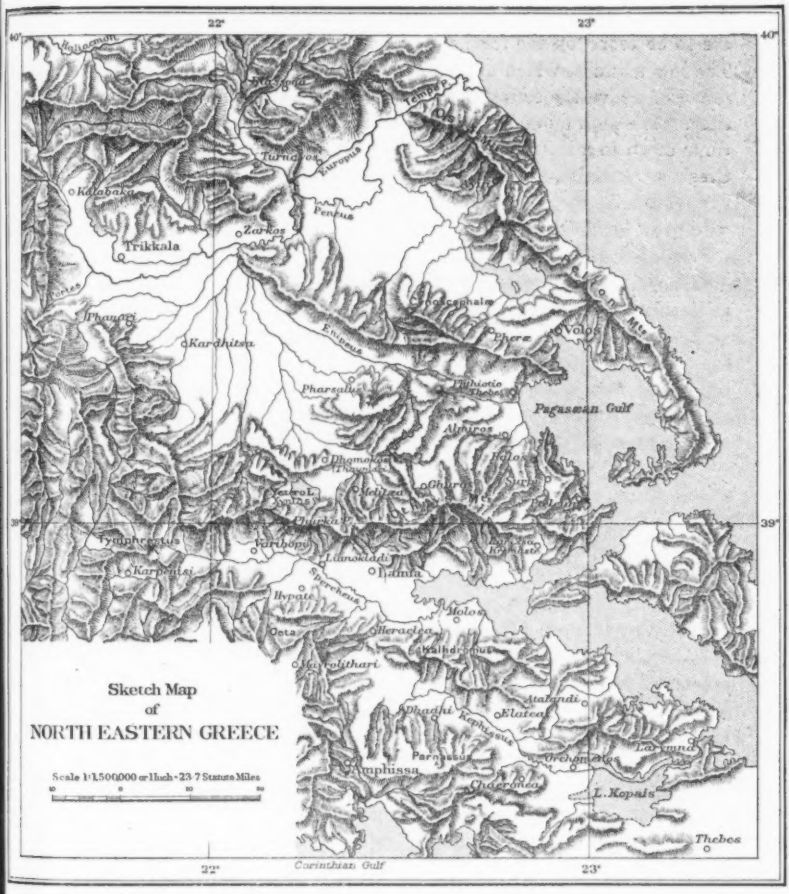
Epirus to Ambracia (Arta), and thence have crept round the coast past Amphilocian Argos into the lower Achelous valley.

To the east the formation of the country is entirely different. Great parallel ranges, starting at right angles from Pindus, run eastward to the sea and divide the land into a series of plains, in which numerous prehistoric settlements are found. The northernmost range, which, separating the basins of the Haliacmon (Vistrista) and of the Peneus (Salambrias), forms the boundary between Thessaly and Macedonia, ends in Olympus. At its extreme east is the pass of Tempe, which, despite its fame, never seems to have been of much practical use. Further west are several much-travelled routes leading from the Europos (Xerias) valley from Elassona to Berrhœa or Pydna. To the west, again, between the Europos and Kalabaka, other routes lead northward into the Haliacmon valley. In spite of these passes, the mountains seem always to have been a formidable barrier, especially since in antiquity they were probably more thickly wooded than now. Immediately to the north of these mountains no traces of prehistoric culture, Thessalian or otherwise, are yet known, not even in the Pierian plain, and in the Vardar (Axius) valley and the neighbourhood of Salonica, where such sites have been found, the culture seems to be different from the Thessalian. To the south as far as Othrys there is a wide plain broken only by the isolated mass of Cynoscephalæ. To the east the plain is shut off from the sea by the coastal range of Pelion and Ossa, but to the south-east by Volos and Almiros on the Pagasæan gulf access to the sea is easy. The range that forms the southern boundary of this plain and the northern limit of the Spercheus valley breaks off from Pindus by Mount Tymphrestus. At its start of but a moderate height, it soon opens out into an elevated plain by Lake Nezero (Xynias) and the upper waters of the Enipeus. Further east this range divides; its northern branch sinks into the low hills that end above Phthiotic Thebes, while the southern rises to the bare summit of Othrys; and between the two lies the fertile plain of Almiros. To-day this range can be crossed at many points. The best-known route in classical times is the coast road from Halos to Lamia by Pteleum and Larissa Kremaste, which was used by Xerxes and Philip II. Further west the hills can be crossed at many points between Lamia and Varibopi, though the principal modern route is the carriage road from Lamia to Dhomokos (Thaumaci) through the Phurka pass. It seems probable that previously thick woods made these routes more difficult.

To the south the Spercheus valley is bounded by Mounts Oeta and Kallidromos. The passes through these may be reduced to three, the Thermopylæ route, which was possibly not open in prehistoric times, a route leading from Heraclea to the upper Asopos, and a third pass leads round Oeta from Hypate by Mavrolithari into Doris.

There is no evidence to show which of these passes was used, but the same early culture is found both to the north and south of them. The plain to the south is the basin of the Kephissos, and is surrounded on all

sides by hills. The main route to the south leads by Orchomenos, and the Lake Kopais to Thebes; and it is near this road shut in between the hills and the marsh, that we find the southern outpost of the early culture of North-East Greece. The sea to the east is easily reached by roads leading through the low hills to Molos, Atalandi, and Larymna, but the passes to



the Corinthian gulf east and west of Parnassus by Daulis and Amphissa are difficult.

Thus the eastern part of Northern Greece is cut up into plains by several parallel ranges through which communications in time of peace are not difficult, although in time of war they form strong military frontiers.

On the other hand, the passes from east to west are few and difficult. There is one route from Yannina over the Zighos to Kalabaka, another from Trikkala by Portes to Arta, and a third from the upper Spercheus by Karpenisi towards Ætolia. But, as will be seen from the distribution of sites, these do not seem to have been much used.

The prehistoric sites which occur throughout the area described above are in the form of mounds, nearly always situated in the plains, but a few are to be found on the foothills. They fall into two types, high and low. The low mounds, which are far commoner than the high, only rise about 3 metres above the surrounding ground. These were deserted at an early date. The high mounds, which rise to a height of 8 metres or more, continue down to a later period, and in a few rare cases were converted into Greek settlements. These mounds are known locally as "Tumbes" or "Maghules." Strictly speaking, the term "Maghula" should be applied only to an artificial mound in which rubbish or traces of human occupation can be discerned, while "Tumba," meaning merely a sepulchral tumulus, does not imply the presence of rubbish or any difference of soil. This distinction is still often recognized by the peasants.

The high mounds are usually oval in shape, with steep sides and flat tops; the low ones rise gently out of the plain. Both types must be distinguished from a small conical type of mound which covers a Hellenistic built tomb, and is also found in the prehistoric area.

The most southerly sites of the early culture of North-Eastern Greece are those in the neighbourhood of Orchomenos, and though the future may reveal settlements further south, it seems unlikely on account of the Cycladic culture near Chalcis. The pass by Orchomenos is, moreover, a natural geographical frontier. Further up the valley is a site at Chæronea, and others further north have been found near Elatea (Dhrakhmani) and Dhadhi.

The next group of sites occurs in the Spercheus valley around the villages of Lianokladhi and Amuri, to the west of Lamia. In antiquity these sites were considerably nearer the coast than they are to-day, owing to the large amount of alluvial deposit brought down by the Spercheus. Higher up the valley, by Varibopi, exploration has failed to produce any results.

In the elevated plain of Othrys, the acropolis of the Greek city at Tsiatma, is probably a maghula of the high type, and an early statuette from Melitæa (Avaritsa) suggests that there is probably a prehistoric settlement in that neighbourhood. On the coast road from Larissa Kremaste to Halos there is a large mound near Surpi. Once north of the range of Othrys, prehistoric mounds are exceedingly common. In the plain of Almiros both types occur, and the high type is more plentiful than elsewhere, there being an equal number of both kinds.

In the west Thessalian plain, extending from Dhomokos in the south to Palamas and Zarkos in the north, and with an eastern limit at Pharsalus and a western one at Kardhitsa, is another group of sites. The sudden

cessation of settlements in the west at a considerable distance short of Pindus, and their non-appearance in the plain between Phanari (Ithome) and Trikkala, suggest that this distribution is due to circumstances that no longer exist.

To the east of Pharsalus is a line of sites extending to the head of the Pagasæan gulf at Volos (Iolcus). In the eastern plain from Pheræ (Velestinos) to Tirnavos and Tempe is another large group, but it is noticeable that there are no prehistoric mounds in the Dotian plain by Ayia, though the Hellenic acropolis at Aliphaklar may have been inhabited in prehistoric times. Thus prehistoric settlements occur throughout the plains except in three small areas. The upper Spercheus valley, the plains between Phanari and Trikkala, and in the Dotian plain. Further, no early remains are known from the plain by Elassona except some late Minoan II. vases from Maghula, and in the elevated plain to the south of Dhomokos prehistoric remains are scarce.

It seems, however, probable that the Thessalian forests, which are now confined to the east slopes of Pelion and Ossa, the north slopes of Othyrs by Ghura and the eastern side of Pindus, formerly extended into the plain. There is some evidence to support this view. Leake, in his travels at the beginning of the nineteenth century, records woods by Ayia in the Dotian plain which now no longer exist, and the same author also notes the recent destruction of forests to the west of Phanari in order to keep down robbers.

Livy's account of the Roman attack on Thaumaci in 191 B.C. also mentions woods where now hardly a tree remains; Xerxes is recorded to have burnt the forests on the Macedonian hills to procure a way for his army. There are also hints of deforestation in mediæval authors, and thus it seems highly probable that in the distribution of the prehistoric sites we have traces of an old forest belt.

The civilization discovered in these North Greek sites, of which over 100 are now known, is of a primitive type, and different from the more advanced Minoan civilization of the south, which apparently only reached Northern Greece in its latest phase, and did not ever replace the local cultures. The existence of a separate culture in Northern Greece, which was still neolithic when bronze was common further south, and which never attained any high state of civilization, is particularly interesting in connection with the usually accepted view that the Achæans were northern invaders. An examination of the present racial distribution in the north of Greece and Macedonia suggests several points which may bear on the question of the character and effects of a racial movement from the north.

When we examine the Homeric geography of Thessaly we find that it covers the same area as the prehistoric civilization, but in certain regions extends beyond it, notably in the Trikkala and Elassona districts. It thus appears that the Homeric culture took over the area occupied by the prehistoric peoples, but extended their territory in certain regions. The

extensions of territory in the north and north-west were probably to guard against invasion from those parts, for we have seen it is by Trikkala and Elassona that main routes come down into Thessaly. In classical times the distribution of the towns inhabited was totally different from both the prehistoric and the Homeric. Further, the historic settlements are in strong positions on the hills, and not unfenced hamlets lying in the plains. Very few of the prehistoric settlements were afterwards inhabited as historic sites. Therefore we may distinguish three periods in the geography of Thessaly, prehistoric, Homeric, and historic. The people of the historic period were invaders from the west or north-west, and were the Thessalians. But that previous migrations of peoples into Thessaly before the coming of the Thessali could have taken place without being noted in history, is shown by the modern conditions, and the steady infiltration of Vlachs into the country. They are a fair race, speaking a Latin language, who live in the hills of the Balkan peninsula. Since the eleventh century they have been wintering in Thessaly, and spending the summer in the homes in the hills of west and south-west Macedonia. From time to time many have settled in Thessaly, and towns like Trikkala and Velestinos are almost entirely Vlach. There is also a large Vlach element in Larissa, Tirnavos, and Kardhitsa. This has had a great effect on the population of Thessaly, but is practically unnoticed in history. Very likely early invasions of wandering tribes gradually drifted into Thessaly in the same way.

Mr. D. G. Hogarth: Mr. Wace has been exceedingly interesting; but as he has wandered over an extraordinarily wide range, far away from the advertised subject of his paper, which was the distribution of Neolithic civilization in Thessaly, it is really rather difficult to know what we are to discuss. The question of the historical routes into north Thessaly is remote from the Neolithic civilization, and certainly the possible ways by which the Vlachs penetrated is even further removed. To come back to the Neolithic civilization, I have one or two, I won't say doubts, but one or two questions. I gather (but I should like to have an assurance) that the authors have exhaustively explored these different parts of Thessaly. It rests upon their evidence alone that there are no prehistoric sites at all in certain parts of this area, and I should like to ask particularly how far they have assured themselves that mounds have not been in certain cases denuded away. I imagine that the process of looking for prehistoric sites is a rather summary one. That is to say, one has to depend upon what one can see from a certain distance. Therefore, if a possible mound does not exceed more than 2 or 3 feet in height, one might easily miss it, and yet, while the actual bulk of the mound had been denuded away, the pottery which had once been in it would be scattered about over a comparatively level area, which would not attract notice from a distance. Therefore, I think we must accept with a certain amount of hesitation, until the district has really been plotted by a mapping party, the statement that there are certain areas in which these remains exist, and certain areas where they do not. It is extremely probable that the theory of Mr. Wace, that the absence of settlements in certain districts is due to the fact that these were covered with

forest uplands, is correct. We know that a very great many parts of the Nearer East were not very different indeed in respect of forest from what they are now. I remember that in the British Consulate at Aleppo, among other notes I came upon a mutilated manuscript of a traveller of, I think, the end of the seventeenth century. He had written a report in which he stated that he had gone through continuous forest the whole way from Aleppo to Birajik, where there is not a solitary tree at the present day. I make, however, this alternative suggestion. We are dealing with a very early period, and with a very feeble age in the history of humanity; probably, also, with a population very small in numbers. Therefore the absence of prehistoric sites in certain parts of Thessaly may be simply due to the fact that there was nobody to found settlements there. The few people who were there may have clustered together in certain districts, and only afterwards, when they had increased in numbers, settled up the other regions. Therefore the slight discrepancy between the geography of the Neolithic and the geography of the Homeric period may be due to difference in time and to the natural increase of race. The only other question about which I want to touch is that of the mountain passes. Mr. Wace and Mr. Thompson, in their paper, have insisted upon the difference between the two sides of Pindus, and Mr. Wace has laid down certain roads from the north as being passable, and certain others as being extremely difficult, though he did not say impassable. We have to be very careful how we talk about passes as being impassable. The difficulty of passes is always a relative matter. I have never been in the Himalaya, but I have read the records of a good many Himalayan travellers, and quite recently what Dr. de Filippi said before this Society; and really, when one comes to consider the appalling character of certain passes over which trade and war were carried in the Himalayas—16,000 and 17,000 feet high and glaciers from one end to the other—one begins to be a little sceptical whether such comparatively easy difficulties as those of the Pindus absolutely stopped transit at any epoch. When I was about in those parts in 1897, I found a great many paths up which nomad pastoral peoples might well have penetrated. So that I feel a little doubt about accepting these decisive mountain barriers between one district and another, upon which some part of the distribution, which Mr. Wace has assumed, depends. But after expressing these doubts, let me also express my exceeding joy that archæology should be called in to explain geography and geography to explain archæology. If the archæological argument is perhaps pressed a little far, that will correct itself in time, and it is all to the good that archæological evidence should be taken into account at all. I think the contribution of Messrs. Wace and Thompson is very important, and at any rate it is a very important sign that in future we shall enlarge the area of these sciences by calling in each to help the other.

Prof. E. GARDNER: I congratulate Mr. Wace on his extremely interesting paper. Mr. Hogarth has very truly said he has wandered very widely, but I think, on the other hand, he has shown us in an interesting way how so wide a range, both in time and subject, does really help. Certainly the modern conditions do take one rather far apart, but these conditions of life seem to throw a great deal of light on the question of early conditions, and also on the question of migrations. As to this question, Mr. Wace has himself cautioned us that we are really only at the beginning of its study. It is too early to say what affinities there are either to the north or south with this Neolithic civilization, especially since there have been somewhat contradictory statements put forward on good authority on the matter. I understand there is a strong

line of demarcation between the Thessalian region here and the region to the north-east, and also that the most southerly outpost of this civilization seems to be found in the neighbourhood of Orchomenos. An interesting question is how soon you get any kind of relation between Thessaly and the great Ægean civilization of which we have been hearing so much lately. I believe that, according to Mr. Wace's opinion expressed elsewhere, you do not get any trace at all of the Ægean influence or Ægean antiquities in these regions until, was it, the third period?

Mr. Wace: About the middle of the fourth period.

Prof. Gardner: The middle of the fourth period; that is the point I wanted to get—the relation of the two. I understand, then, that this is the earliest contact with Crete; that there are relations with southern Greece, but not with Crete, in the third period. That is the question I wanted to ask, because that is the question which I think all of us feel is of extreme interest. It seems, then, that in the early period there is absolutely no relation between the Ægean region and the Thessalian area.

Prof. Myres: We have the pleasure of having Baron Nopcsa here to-day, who has made journeys in this region, and I am sure the Committee would be very glad if he would give us his opinions.

Baron Nopcsa: Three points in this paper specially struck my attention. The first was the resemblance of the pottery of the second period with the pottery of the lower Danube and the Rumanian. I should like to draw attention to the fact that quite similar pottery has been discovered even in southern Russia. I would like to put a question as to the relations of the pottery Mr. Wace found and of the Neolithic pottery of Bosnia; the things did not seem to show any great resemblance. The second point I want to refer to, but which has been dealt with a great deal by other gentlemen, is the question of the passes on the Pindus. Until a few years ago, it was quite a regular thing for the Rumanian shepherds of Transylvania to go down to the Dobrogea in search of food. The Albanians who have got their flocks up in summer by Gusinje come in summer right down to Durazzo. Two years ago there was no rain on the Albanian mountains, in consequence no grass, and in consequence even the shepherds of Rugova had to go down to the plains of Durazzo. If the Albanian Alp mountains and the southern Karpathians are not impassable for shepherds and their flocks, I believe the Pindus would not be. As to the third point, this is quite interesting, because it is the first time that archæology has been brought in contact with modern life. I would only mention that by deepening this line of research, we may find, especially on the Balkan peninsula, quite interesting results. You know that idol of Kliševac in Servia. It is the figure of a woman with an elaborate dress, and if we compare that idol with the dresses found in Minoan Crete, there is a striking similarity. I found exactly the same type of skirt in the Albanian mountains; other similitudes could likewise be mentioned. I can only express my great thanks to the gentlemen for permitting me to hear to-day this most interesting paper.

Dr. Stein: I certainly came here only as a learner; for it has not been my good fortune ever to work on European soil in the field of early ethnology and archæology. But I have had the chance of doing that in India and Central Asia, and from the experiences there gained I can strongly support Dr. Hogarth's remarks about the assumed impracticability of certain passes in early times. Kashmir, a part of India of which we know the historical topography with fair accuracy for something like two thousand years back, is

an excellent example. Kashmir was until relatively recent times separated from the rest of India by mountain ramparts which rendered the use of laden transport practically impossible for serious invasion. Yet we know that Kashmir has shared every great change in the civilization and history of India from the very earliest times onwards. Of course, all the traffic across the great mountain barriers was done by the human beast of burden, which is plentifully obtained and offers the advantage of not being dependent on grazing. Where the routes from Kashmir into Central Asia are practicable for laden animals, as, *e.g.*, across the Karakoram, more than 18,000 feet high, the losses in beasts are even now exceptionally heavy. Yet this fact has neither stopped trade nor prevented invasion. The employment of the human beast of burden was in prehistoric times probably quite as easy as it is nowadays.

I do not feel competent to express an opinion as to the conclusions which have been drawn from the absence of prehistoric remains in certain parts of that area which Mr. Wace has described in so interesting a manner. But I know by experience that climatic and purely physical conditions may very seriously interfere with the possibility of observing such remains. There is no reason whatever to believe that in the great Central Asian basin prehistoric civilization was limited exactly to the neighbourhood of Lop-nor. Yet up to the present no prehistoric remains are known to have been discovered except there. The reason is a purely physical one: wind erosion has been exceptionally active there, as we can accurately determine by the lowering of the general ground-level effected during the last 1700 years. In that region erosion has proceeded so far that the remains of prehistoric times lie now exposed on the surface of the desert.

I have been much interested in what we have heard about the migration of the Vlakhs, especially as it seems to supply a clear instance of habits of life surviving even when the original causes have disappeared or been greatly modified. All along the foot of the Himalayas we have the ancient and far-spread race of the Gujars, who spend their lives in passing with their flocks from the plains up to grazing-grounds as high as 12,000 to 13,000 feet above the sea and back again. But in their case, of course, it is invariably the regard for the flocks which causes the migration. The stage where the grazing has lost in importance by the side of agriculture and where migration during the summer months yet continues to be regular, is also represented among the Pathan tribes of our North-West frontier of India. In this, as in many other respects, the conditions of life there present striking parallels to those prevailing in Albania. I think, our special thanks are due to Mr. Wace for showing us so much of the present condition of the population. I also believe, it is only by studying relics such as Baron Nopcsa has mentioned that we can hope to obtain some living idea, I think, of earlier historic and prehistoric times. I must thank Mr. Wace and his colleagues for the very stimulating observations they have placed before us.

Mr. J. P. Droop: What perhaps I can do is to give some kind of answer to M. Hogarth's first question, about the absence of prehistoric settlements in the north-west corner of Thessaly. It was not as if we had looked across the country, and, because it was absolutely flat, had just assumed that there were no settlements there, but we tramped across the various rises and drew absolutely blank from them. I believe that Mr. Wace has been there since, and I certainly think that there is very little doubt indeed that there is nothing of the sort there.

Colonel F. R. Maunsell: I have never actually been in Thessaly, but I was

struck by a curious fact on looking at the photographs which the lecturer has shown us. When Consul at Van, in Asiatic Turkey, we excavated some low mounds in the plain near the town, and discovered, quite by accident, many Neolithic remains, including pottery, household implements, bone needles, flint knives, stone hammers, and some other objects which were almost exactly the same as those shown in the photographs coming from Thessaly. There was one piece of pottery which had just the same zigzag pattern trace in reddish paint.

Mr. M. S. Thompson: The question has been raised as to the connection between the early civilizations in Thessaly and those in Rumania and southern Russia. There seems to be a connection of a kind, and I think it will be found that these civilizations belong to people who dwelt in the plains. In northern Greece this is certainly the case. Until Macedonia is explored, how close this connection is cannot be known; it seems to me at present to be slight, and to show that there were a number of different cultures developing side by side rather than any single culture extending over a large area.

The Vlachs seem to form an interesting parallel to the manner in which northern tribes, such as Achaeans, may have entered Greece. As opposed to the Greeks, the Vlachs are of a northern type and up to the last twenty years have been gradually mixing with the Greeks and becoming Hellenized. There are, in fact, to-day in Greece a large number of people who call themselves Hellenes, and are Greeks in their ideals but are Vlach in origin. The physical type shows their northern blood. Such a gradual infiltration of northern blood would leave no archæological traces behind it, and yet northern types would eventually be recorded even in the south of Greece. By examining what is still happening to-day it may be possible to obtain some hints of what probably happened in the past.

Mr. A. M. Woodward: I should like just to ask one question arising out of what has been said. I wondered whether one could create, so to speak, an artificial connection between the two halves of this paper by asking whether the people who built these settlements in the Thessalian plains were in the habit of going up into the hills in the summer, like the people nowadays, or whether they are supposed to have stayed down in those plains all the year round. Of course it is not unnatural that, if they made excursions up into the hills when the hot weather came on, they would only take tents with them; they would not build stone houses. That would mean that in the higher plains no mounds have been found because they were only summer quarters. I do not know the relative height or climate of the country where no mounds have been found, and of the plains below. There is another point, in which I can supply a small link in the chain between the habits of the Vlachs going up from the hot plains into the cool pastures in the summer, and Dr. Stein's experiences of the passes being crossed over the Himalaya into the cooler pastures. I mean the habits of the Turkish shepherds, who go up from the Pamphylian plains in the hot weather, where I imagine that it is absolutely hopeless to expect their flocks, on which they very largely depend, to survive the summer heat; therefore they naturally go up into the high plains of northern Lycia, and the plains watered by the rivers that trend down into southern Phrygia. This they have probably been doing from time immemorial. Probably the pre-Ottoman inhabitants of Asia Minor did the same. And this custom may be, as has been suggested to me, at the back of the story that the Oracle of the Patarean Apollo only worked in the colder months, because the god himself went up to the hills from the unhealthy Lycian coast in the summer. This

only illustrates that it is the natural habit of pastoral people, and it is a mistake to suppose that it is peculiar to the Balkans, that they should go up from low-lying plains, particularly those which are likely to breed malaria; and, to return to my first question, if we could assume that Mr. Wace's prehistoric people did not go up to the cooler districts in the summer, were they therefore perhaps not pastoral?

Prof. MYRES: I think we shall be agreed in expressing our thanks to Mr. Wace and Mr. Thompson for the paper which they have given us, and for the way in which they have illustrated it by their slides and Mr. Wace's comments on them. The paper has ranged over a very wide ground, and the lines of connection between some parts of it appear at first sight remote. At the same time there is, I believe, a real connection between all the different lines of reasoning which Mr. Wace has brought before us. It is the particular value of a conference of this kind that it enables us to approach a rather complicated and many-sided problem from a number of special points of view.

I think it is only fair to call the attention of the Department to the fact that all this line of work in North Greece is still in its infancy. It is a very flourishing infant, as I think you will agree, but in its present form the whole question is less than ten years old. It was, in fact, less than ten years ago that the first systematic excavation of an early site in Thessaly was completed, and apart from those first excavations by Greek archæologists, particularly by Dr. Tsountas on behalf of the Greek Archæological Society, practically the whole of the new material has been contributed by the excavations of Mr. Wace and Mr. Thompson and their colleagues. So that I think we have reason to congratulate them on the extent to which they have been able to shape the outlines of the questions they want to ask, and still more upon the extent to which they have been able to provide provisional working hypotheses for the solution of them, and to direct their researches into fresh lines of evidence in this and neighbouring districts. I think it need be no secret that they have already been into Macedonia, and that they intend to go there again; and I have considerable hope that before long there will be much more detailed information as to those northern districts in which early mounds occur than we have at the present time. That will go a very long way towards filling up the gap which exists between the comparatively well-explored plains of Central Greece and Thessaly, and that other very fairly well explored area in northern Servia, where Dr. Vassits has (again in the course of the last ten years) recovered a vast quantity of fresh information as to the distribution and character of the neolithic civilization this side of the Danubian basin. The question, however, as I think is abundantly clear, is as yet in a very early stage. The distribution of the sites, though it has been roughed out, as I think we shall all admit, is by no means finally determined. It is possible, as has been suggested, that under given conditions of rainfall, and so forth, mounds may be washed away much more rapidly in some parts of an area than in others. In that point I think we ought to ask the geologists to help us. The surface geology is sufficiently well explored for it to be possible by comparison with the geological maps, especially if these include any note of the surface deposits, to discover whether there is anything in the composition of the soil of which the mounds are composed which would be more favourable to their demolition in one place than another. But I feel, myself, that the suggestion which Mr. Wace has put forward is very probably the true one, namely, that the points at which the mounds cease, in an area so comparatively uniform as that western plain which runs up in the direction of Trikkala, is that they extended over all the area

which was already sufficiently open to be easily habitable by neolithic man, but ceased at the point where forests became dense enough to impede further progress. I believe I am right in interpreting Mr. Wace's record, in the sense that these settlements are settlements of cattle-using folk, and if so, it is pretty clear that anything like thick woodland would offer an almost insuperable bar to the extension of that mode of life. I refer, of course, to the kind of thing which is happening persistently all along the slopes of the great equatorial highlands of Africa, where pastoral life is only practicable above a certain altitude, and tribes are only driven down into tropical jungle, if for any cause they lose their cattle.

A further point is this, that in the forest there are the trees themselves for timber, which, as Mr. Wace has pointed out, is the primary material for any kind of permanent shelter there. That is to say, within a forest area, habitations are likely to be timber habitations, and such huts, if they burn or decay, leave practically no trace behind them. It is only outside the area of dense forest, in drier and more open and comparatively treeless areas, that (in the absence of timber) there is more "daub" and less "wattle" in the construction of the houses. Under those circumstances, you will see that the amount of *débris* on a particular site will vary according as that site itself is within the timber area or is out on the timberless grassland. The only qualification which I should add is this, that we should wish to be assured of the extent to which nomadism, of the kind which Mr. Wace has indicated as one of the habitual modes of life in that region, is associated with abstinence from permanent settlements of stone or mud brick; or how far, as I think I am right in assuming from what he said, nomadism of the kind of which he has indicated is compatible with stone houses at the top end of the seasonal orbit of the nomads, and perhaps also at the lower end as well. That is one fresh point which it occurs to me to suggest for consideration by Mr. Wace and his colleagues.

Meanwhile I should like, in your name, to thank Mr. Wace and Mr. Thompson for the paper they have given us.

Mr. A. J. B. Wace: I do not think I have really anything to say. I should really make an apology to you for having covered such a wide area in my paper. As regards the neolithic habitation of the western part of the Thessalian plains, we have been three times in that portion of the plains; we have carefully searched the plains ourselves, as well as inquired of the peasants whether there are any mounds. We have visited several presumed mounds that we could see in the distance, and found them not to consist of prehistoric *débris*, but of lumps of limestone. I do not think there are any prehistoric mounds in that region, and I can see no reason why, if there had been, they should have disappeared in the western part and not in the eastern, because it is all one plain, rising very slightly as it goes up to the hills. The climatic conditions are exactly the same.

THE DANUBE.*

By EDUARD SUESS.

Between the four great mountain strongholds of Austria-Hungary—the Tirol, Bohemia, Siebenbürgen, and Bosnia—the Danube, the greatest river of this

* Abstract of address delivered by the President of the Vienna Academy of Sciences on the occasion of the Jubilee of the Archduke Rainer as its Curator.

continent, rolls its flood. To the question, where does it rise? the school-books give answer, "at Donau-Eschingen, in the Grand Duchy of Baden." But the case is not so simple. Two head-streams, the Brigach and the Brege, flow down from the primitive highlands of the Black Forest, and, uniting at Donau-Eschingen with the spring which rises at its castle, thenceforth take the name of Danube. But after a course of 12 miles the volume of the stream declines, and in time of drought—often for three or four months in succession—the upper or Black Forest Danube disappears. Eight miles to the south, at a level lower by 560 feet, the stream reappears as the Aach, and enters the Lake of Constance at Radolfzell. It thus comes about that just that part of the upper Danube which remains in existence at low water finds its way, not to the Black sea, but through the Lake of Constance to the Rhine and the North sea. Only below Friedigen, in the neighbourhood of Beuron, is water again collected in the bed of the river, and it may thus be held that the Danube, as a permanent stream, rises not in Baden but in Württemberg.* Flowing on with a fairly rapid fall towards Ulm, the Danube reaches a spot where an exactly opposite state of things may once have prevailed. In the Schussental, which runs south to the Lake of Constance near Friedrichshafen, the water-parting towards the Danube is formed by a recent moraine, and the possibility is therefore suggested that in former times the Lake of Constance may have found an outlet by this valley to the Danube, the junction with which would have taken place a little above Ulm. In this case the water-supplies of a considerable part of the Swiss Alps would be taken from the Rhine and added to the Danube.

We have now reached the Bavarian plain, with a slope to the north which pushes the stream in the same direction, causing it to impinge on the spurs of the limestone massif of Franconia. Ingolstadt was formerly not on the Danube, which has only in later times broken away through the rocky pass near Neuburg. It is a natural question to ask why the Danube has opened this passage through the limestone massif when a much easier way lay open to it. The question becomes still more insistent as we near the Austrian frontier, where, though a course was open to the river by Braunau and Wels, and along the foot of the northern mountains past St. Pölten, it has not followed this, but has forced a way into the hard granite and gneiss of the Bohemian massif above Passau, and, cutting a deep channel in these, remains confined for the most part within a rocky bed as far as the eastern border of the Bohemian primitive mass near Krems. It has cut off whole sections of this, which, like the heights south of Linz and the rock masses of Melk and Göttweih, rise aloft on its right bank. Further, not only have its left-bank tributaries cut themselves channels in the primitive rocks, but even on its right bank some of its tributaries (*e.g.* the lower courses of the Vils and Inn) have, like itself, left the plain to enter the mountains. Thus, not the Danube only, but a section of its whole system has stamped its impress from above on the old mountain mass, and cut down into the same. Such valleys and valley-systems are known as epigenetic. In this part of the Danube's course the sandstones and limestones of the southern massif (the Alps) stand in strong contrast to the granite and gneiss of the northern (the primitive mountains of Bohemia); the latter falling southwards towards the former. Now the primitive massif bears traces of more recent marine deposits of white sand, which extend to a considerable height above the Danube; and, further, we find on it, up to a height of 1500 to 1600 feet, rocks whose place of origin was certainly in the Alps. The conclusion, therefore, is that the present form of the plain dates from recent times.

* On the Danube-Rhine connection here alluded to, see *Journal*, vol. **31**, p. 440.

At Krems we leave the primitive zone and soon reach the narrows of Klosterneuberg, where the Danube crosses the outer or sandstone zone of the Alps. Here the case is not so much that of a sawing through, as of an actual sinking of a portion of the Alps. In this way the intra-Alpine basin of Vienna took shape. Here the Danube receives a large amount of underground water which has been collected from the fissured region about Neustadt and elsewhere. Most of it finds its way to the Danube near Fischamend, where it assumes quite the character of a dead branch of the river; and having, as is usually the case with ground-water, a nearly constant temperature some 16° Fahr. above the freezing-point, it creates a winter harbour for shipping almost entirely free from ice.

The course of the Danube has often been compared to a rope stretched horizontally, the points at which it is fixed or supported being represented by the rocky defiles. Between these it shows a marked tendency to deviate to the right, as *e.g.* between Leopoldsberg and Theben. In Hungary this deviation to the right becomes still more marked. The long rocky pass between Gran and Budapest forces it to bend through a right angle, and it takes a southward direction for a long distance. The Drave, with its higher right bank, now enters from the west, the two streams meeting at a right angle. But the Drave, thanks to its elevated bank, gains the mastery, and compels the Danube to assume its own direction. The heights of Belgrade determine the direction, not only of the Danube, but of the lower course of the Save. This deviation to the right, which is particularly marked in the case of the Siberian rivers, is, as was first shown by Von Baer, a result of the rotation of the Earth.

Much more might be said as to the physical character of the Danube, but some attention must be paid to Man's appearance and activity in the valley of the great stream. We find him already present, long before the dawn of historical chronology. To meet with the earliest known traces of his presence we must ascend the Save valley, where, near Krapina in Kroatia, they exist in association with rough stone implements and an extinct species of rhinoceros. Man of that time was a strange-looking being, with retreating chin and processes of bone over the eyes. More recent, but on the far side of all existing history, are the human remains of the loess, *e.g.* in the neighbourhood of Krems. Of still later date are the inhabitants of the pile-dwellings, such as we find on the Laibach moor and on the south side of the Neusiedler-See; such dwellings date back to the middle of the first millennium before our era. To the same period may perhaps belong the traces of an advanced civilization, assignable to the so-called Hallstatt era, which some have considered indigenous, others, to have been imported from Northern Italy.

The Romans now appear on the scene. From Bavaria to far beyond Carnuntum the right bank of the Danube is marked with remains of the "limes"—the series of fortifications, camps, and watch-towers by which the Roman emperors guarded this section of the frontier. They were linked together by a military road. In the uppermost section of the rock-valley of the upper Danube legend has it that Kriemhild was brought to King Attila. The armies of Charlemagne, too, passed by this route, marching, probably, along the remnants of the Roman *limes*. Along the Danube, too, a large part of the Crusaders took their way, and by the same road did Rudolf of Habsburg enter the land. To Christendom the Danube formed a main line of communication, as is witnessed by the noble religious edifices which rise above its banks. Ebelsberg, with its memories of the sanguinary fight at the Traunbrück, reminds us that Napoleon too used this route. Coming to the mouth of the Enns, we find the small village of Lorch, representing Laureacum, the headquarters of a part of the

second Roman legion, and of the flotilla of the Danube. Here, in the year 303, St. Florian suffered martyrdom in the Enns. Hence St. Rupert sallied forth to found Salzburg. But its glory has departed, and the metals of the Kaiserin-Elizabeth railway pass through what was once the camp of the legion.

Once more we enter the rock-valley and pass on to the lovely Wall-See, to the whirlpool of Grein (the *hospitium mortis* of an old historian), and to the romance-girt ruins of the Aggstein and the Dürnstein, finally leaving it between Krems and Göttweig. Greeted by the newly-restored battlements of Castle Kreuzenstein, and passing the slopes of Nussdorf and the field which saw the great slaughter of the Turks, we reach Vienna. Through the very centre of the city runs the scarped right bank of the river, formed under the influence of the Earth's rotation, on which stood the northern front of Vienna's fortifications from Roman times to within the nineteenth century, and which is to-day crowned by the church of St. Rupert. A long, straight, and stony strip with scanty growth of grass comes into view, and we find ourselves on the Franzosen-strasse. Beyond, on the left, extend the green flats of the lower March, and still further on, to the right, we see the ruins of Carnuntum, the proud predecessor of Vienna.. By the pass of Theben we reach Pressburg, and passing in succession Komorn—the fortress which bars the passage of the Danube—Visegrad, and the cathedral of Gran, come to the fine city of Budapest. Crowds of recollections throng upon us. We pass Mohács and the fortifications of Belgrade, and soon have beside us the famous work of Trajan's legions—the remnant of the Roman road which is our companion through the defile of the Iron Gate. Last of all, at the extreme southern limit of Hungary, comes the little valley over against Orsova, where on native soil the crown of St. Stephen waited not in vain the hour of restitution.

In conclusion, let us return once more to the headwaters of the great stream, and note the importance in its economy of the contributions brought by the Inn from the melting snows of the Alps. And as the drops which trickle from the margin of one of these Alpine snowfields unite to form rivers which find their way by different routes to the Black or North seas, so is it with the thoughts of men. Obscure as these are in their origin, and diverse in the course they pursue, great achievements result from the converging efforts of a multitude of individuals, differing in nationality but united in one common aim. The monument in the Singerstrasse at Vienna reminds us how the Emperor Maximilian banished barbarism from Germany. This takes us back four centuries, to the time of Konrad Celtes and the "Society of the Danube" of which he was the heart and soul, and in which the first organized effort at International Union took shape.

REVIEWS.

EUROPE.

British Waterways.

'Royal Commission on Canals and Waterways.' Vols. 8–10. London: Wyman & Sons. 1910.

The final Report of the Commissioners, as embodied in vol. 7, was reviewed in the *Journal* for May, 1910. Vols. 8, 9, and 10 have now been issued. Vol. 8 consists of appendices to the fourth and final Report, and deals with a variety of matters, such as relative cost of transport by rail and water in different

countries; analyses of canals' returns; statistics relative to canals; relative advantages of lifts and inclines. It contains a large amount of very useful information on such matters.

Vol. 9 is divided into three parts. Part 1 contains reports by Sir J. Wolfe Barry & Partners, dealing with costs of improving to two separate standards the canal and river routes connecting the Midlands and South Staffordshire with the estuaries of the Thames, Humber, Mersey, and Severn; part 2 contains statistical surveys of the four routes; and part 3 gives longitudinal and cross-sections of these routes, and the drawings relative to the proposed alterations.

Vol. 10 contains the report of the Committee on Water-Supply. This committee was appointed by resolution on June 18, 1907, and was instructed to report on the sufficiency or otherwise of the water-supplies at present available along the routes in the event of their improvement. For the purpose of the calculations as to the quantity of water available, plans and sections were prepared for each route, showing the positions of the reservoirs, streams, and pumping stations on each waterway. The areas of the catchments of the reservoirs and streams were computed from the Ordnance Survey maps. Rainfall statistics were obtained from the records in 'British Rainfall' and 'Rainfall Tables of the British Isles,' and were reduced to thirty-year standards. The reports aim at a fair statement of what the position of each route would be with respect to the water-supply: (*a*) in the event of the schemes being carried out on the lines suggested; (*b*) when the required traffic had been reached; and (*c*) when a year of minimum rainfall occurred.

In dealing with the difficulties of the investigation, emphasis is laid on the lack of statistics as to flows of streams, proportion of rainfall available (run off), amount of evaporation from water surfaces, percolation through canal banks, and absorption by vegetation. It is stated that the lack of such statistics has "rendered the calculations not only more laborious, but probably less accurate than would have been the case had such records been available."

The general results of the investigation show that (1) the river portion of the routes formed by the rivers Trent, Severn, Weaver, and Soar could be made capable of passing much larger craft than at present without experiencing any difficulty with respect to the water-supply; (2) the canal portions of the routes which traverse central England would require a greatly augmented water-supply for any scheme of improvement to the standards investigated by the Commission.

The conclusions of the committee as contained in the reports may be summarized as follows: Route (1) connecting Birmingham with London. There is sufficient water for the 100-ton boat scheme, but not for the 300-ton boat scheme. Route (2) Nottingham and Leicester to the estuary of the Humber. There is sufficient water for the 300-ton scheme on the Trent as far as Nottingham; but from Leicester to Norton Junction there is only sufficient for the 100-ton scheme. Route (3) Birmingham and the Trent with the Mersey. There is water enough for the 100-ton scheme over the whole route, but enough for the 300-ton scheme only from Fradley Junction to Trent Junction. Route (4) Wolverhampton to the Mersey and Severn. There is water enough for the 100-ton scheme, but enough for the 300-ton scheme could only be got with great difficulty and cost. The part connecting Birmingham with the Severn could be supplied with water for either scheme at moderate cost.

J. S. O.

ASIA.

China and Tibet.

'Adventure, Sport, and Travel on the Tibetan Steppes.' By W. N. Fergusson. London: Constable & Co. 1911. *Maps and Illustrations.* 16*s. net.*

Here is a book written by a man on behalf of a friend, and it says much for the quality of the friendship that "Jock" Brooke (the hero of the story) should have found so sympathetic and so able a biographer as Mr. W. N. Fergusson. Brooke's heart from the very first was in adventure and travel. Nature was the book which he loved to read, and from the early days when he (and his sister) spent their rough and rocky, but intensely happy, holidays as gull-catchers on the north coast of Ireland, his whole soul reached out towards the wild. Once free from the irksome trammels of military life in times of peace, he set himself to qualify for the solution of some of the geographical problems which yet remain to be unravelled. His latest ideal was the determination of the Brahmaputra question. It can hardly be called a problem, for it is perfectly well known how the Brahmaputra finds its way from the plateau of Tibet to the plains of India, but its course has never been mapped, and beyond its great elbow or bend there is hidden in the gigantic hills of the Tibetan frontier much of mystery geographically, and of intense interest ethnographically. This was just the "call" for Brooke. He found an unknown wilderness quite after his own heart, and the only difficulty was to get there. The road by India he soon proved to be barred. Indeed, recent events in the valley of the Dihong amply justify the caution exercised by the Indian Government in not permitting the adventurous traveller to pass that way into Tibet, for fear of the almost inevitable "complications." So Brooke tried the way that is really straightest—*viâ* the Tibeto-Chinese frontier. His first venture was by the well-known route from the north-east, from Koko Nor over the Tangla to the districts more immediately under Lhasa domination. Here, of course, he was met with the usual *non possumus*, and after various attempts to evade the vigilance of the aggressive Tibetan guards, he had, like others before him, to give up the hope of further advance and retrace his weary footsteps through the salt-caked deserts and windy steppes of Northern Tibet. It was a sore disappointment, but keenest of all his miseries was that of losing one by one the faithful animals that shared his march and his privations. Camels, mules, ponies, and dogs—he loved them all, and they were all his friends. The strange affinity with living Nature which would arouse an ecstasy of admiration for a new poppy, extended itself even to things inanimate. Clouds and mountains, ever-varying light and shade, the misty distance or blazing colour of the entrancing landscapes (not, certainly, of high Tibet, but) of the wonderful mountain districts which lie below Tibet in Western Sechuan—all appealed to him in a manner which might be deemed quaint and unusual in an ex-subaltern of Hussars. Without understanding this it would be impossible to understand Jock Brooke.

He left Shanghai on this, his first, journey in August, 1906, returning in October, 1907, and it was on this journey that, in company with the missionary Mr. Ridly, he interviewed the Dalai Lama at Sining. Brooke's impressions of that interesting potentate are not very flattering. He found him as wooden as one of his own idols. It was on this journey, too, that a rough-and-tumble fight occurred with a Goluk robber when Brooke was absolutely unarmed, which might well have ended his career a year or so before that end actually came. It illustrates a certain carelessness, or thoughtlessness, in his methods as regards

his own personal safety which was certainly characteristic, but which is hardly to be commended to travellers in the rougher regions of Asia.

On his second journey he left Shanghai in December, 1907, and he lost his life at the hands of the Lolos in December, 1908. On this second journey he was accompanied by Mr. C. H. Meares (now with Scott's Antarctic Expedition) and by the writer of the book, Mr. Fergusson, and from this point the story of sport and adventure is told at first hand. Regarding it simply as a record of mountaineering and sport, it is a thrilling tale of strenuous endeavour. We know now something of the extension of the haunts of ibex, *Ovis ammon* (burhal), serow, and of that rare beast the takin, of which a specimen is for the first time to be seen in the Regent's Park Zoo. But incidentally this work is a great deal more than a sportsman's record.

Brooke stepped over the border into the dangerous Lolo land without consulting his colleagues, and there he met his fate with all the traditional pluck of his race (a Yorkshire race), doing his best for his party and himself, till all were struck down by the Lolo following of the chief, who himself struck the first blow, and was promptly shot by Brooke. Two much-damaged survivors were subsequently found, sold into slavery, and their story is the central interest of the book. They were recovered by the Chinese officials of the frontier when, eighty days after the murder, the still frozen bodies of the leader and some of his men were recovered and identified by Mr. Fergusson. Now the brave heart of the young explorer lies at rest in the little cemetery near the mission station of Chentu, and one more is added to the long tale of sacrifice which geographical adventure claims from its devotees.

And now a word for the author of the book. I have once before had the pleasure of calling attention to the excellent geographical work of Mr. Fergusson. A map of Mr. Fergusson's will be found in the December number of the *Journal* for 1908, which illustrates the skill and success with which an amateur can wield the plane-table. To this, with Brooke's assistance, he has since added an extension southward which includes Lolo-land, and is sufficiently in detail to show its general character.* Who are these remarkable people, worshipping fire and oak trees, who defy Chinese authority, and hold their own by right of their extraordinary capacity for hill fighting? As mountaineers they seem to rival the Kafirs of the Hindu Kush, and as mountain strategists they could give the Kafirs many points. Are they really the representatives of the last drift of the ancient Assamese, driven across the mountains, as Mr. Fergusson supposes? There are still strange secrets to be unearthed in the deep valleys of the rivers of Tibet seeking the ocean by way of Burma and China. Who are the cross-bowmen of the upper Salwin, for instance, and where did they learn the use of the weapon? Again, there are the Miao referred to in the Chinese annals translated by Mr. Fergusson, said to date from 2500 B.C., who occupied "the country of Salung." Are the cave dwellings and terra cotta images of Omai, together with the Lolos themselves, to be associated with them? Reading Mr. Fergusson's suggestion of a certain connection between Lolo and Korean, one instinctively thinks, a little farther east, of the Maya and his terra cotta images in Mexico. Apparently these latter are not unlike the Omai specimens. There is food enough and to spare for the ethnological speculator in this book. And there is something more. Mr. Fergusson is not exactly a missionary. He is an agent for the British and Foreign Bible Society for the distribution of our Scriptures. Incidentally we learn a good deal

* Mr. Fergusson's second map was also originally published in the *Journal* (October, 1910).

about Western Chinese missions, and we learn it in a useful way. A book like this, telling a plain, unvarnished, and withal most interesting tale, appeals to a far larger public than the most devotional outpourings of the ordinary missionary pamphlet or report. No one can scoff at Chinese missions after reading Fergusson's book. Scoffers, perhaps, are rare nowadays. It is not gentlemanly to scoff; but doubters there are in thousands, and to all of them is this book to be commended. In view of the fact that a Christian mission existed and flourished in Lhasa in the middle of the eighteenth century, it is most interesting to learn that the frontier mission outpost in Western China is to be advanced from Tachien-lu (the great eastern gateway of Tibet) to Batang. It will be the missionaries, after all, who will show the way from China to India. If the British and Foreign Bible Society has many agents like Mr. W. N. Fergusson, then indeed will the Royal Geographical Society be right glad to know who they are and where they are at work. T. H. H.

THROUGH ASIA FROM SOUTH TO NORTH.

'Across the Roof of the World.' By Lieut. P. T. Etherton. London: Constable & Co. 1911. *Map and Illustrations.* 16*s. net.*

Mr. Etherton's story of his journey northward from Srinagar across the Pamirs to Chinese Turkestan, and thence by Kulja across the steppes beyond to a final junction with the Russian trans-Siberian railway, is a story of sport and adventure rather than of geographical research. Incidentally, Mr. Etherton did certainly exploit one or two unknown passes about the upper reaches of the Yarkand river, the exact location of which is hardly intelligible without a detailed map; but, generally, he adhered to routes which are geographically well known, although always interesting to students of Central Asian topography. The impression derived from the description of the well-known route *viâ* Gilgit and Hunza over the Mintaka pass into the Tagdumbash Pamir is that Mr. Etherton increased the difficulties of the journey by starting too early in the year. This, no doubt, was due to his anxiety to be on the *Ovis poli* ground at a time when the chances of good sport are supposed to be best. His experiences are a useful indication of the abnormal variation in the conditions which govern those highland routes, where one traveller may find an open highway and the next be blocked by almost insuperable difficulties. Once in the lowlands of Chinese Turkestan, there is nothing more than the incidents common to Central Asian travel to record. His journey over the Tian Shan and across the snow-bound Siberian steppes to the railway must form a most delightful reminiscence, and the story of it should prove a sound encouragement to other young officers of the Indian army to extend their knowledge of the Asiatic world (especially where Russia touches China) by similar feats of activity and intelligent observation. Mr. Etherton writes a straight and unvarnished narrative of the incidents of a real good sporting holiday. There is nothing specially thrilling even in the realms of sport, although it is possible that if the two bears who combined to charge the gallant officer had really meant business, it would have fallen to some one else to describe a Pamir funeral. Perhaps the most remarkable episode was the rapid descent of one of the yaks down 2500 feet of snow-slide and declivities. That a yak should lose its footing in the snow is almost unheard of. This yak did so, and the subsequent search for, and picking up of, the pieces is most graphically described. Mr. Etherton is to be congratulated, not only on the success of his "bag," but on having written a very useful and readable book from the sportsman's point of view—a book which should form a standard record in the library of his regiment, the 39th Garhwal Rifles. T. H. H.

'Astronomie Cambodgienne.' By F. G. Farout. (Saigon: Schneider. 1910. Pp. 283. *Illustrations.*) This study of the Khmer system of astronomy is the outcome of patient investigation, the higher fruits of which are to be gathered by experts. But the generally intelligible basis of the science is sufficiently remarkable; the Khmers founded their astronomical system on the theory of a circular flat Earth, with a mountain massif dominated by a central peak as the centre round which the sun and other celestial bodies revolve, the sun having also a vertical movement of ascent and descent. The whole system was worked out in curious and apparently self-explanatory detail, and though much of this is lost, enough remains to serve as a remarkable memorial of its founders.

AFRICA.

Egypt and the Anglo-Egyptian Sudan.

'Egypt as we knew it.' By E. L. Butcher. *Illustrations.* London: Mills & Boon. 1911. 6*s. net.*

'The New Spirit in Egypt.' By H. Hamilton Fyfe. Edinburgh & London: W. Blackwood & Sons. 1911. 5*s. net.*

'England in the Sudan.' By Yacoub Pasha Artin. Translated from the French by George Robb. *Illustrations and Maps.* London: Macmillan & Co. 1911. 10*s. net.*

Mrs. Butcher's little book is a very unassuming, and a very charming, collection of sketches of various aspects of life in Egypt, some of them dating back to the days of Ismail Pasha. These are not impressions of a passing tourist, but those of a lady exceptionally qualified to speak with authority, especially when dealing (as Mrs. Butcher largely does deal) with the social and religious life of the Copts. Sympathetically drawn, these descriptions of the Copts at home and at church, fasting and feasting, bring out admirably the strength and the weaknesses of the Christian part of the population of Egypt. There is also a chapter on Dean Butcher—the parson of all work—which, among other things, helps the untravelled reader to realize the extraordinary medley of Oriental Christian sects which Cairo harbours. Mrs. Butcher, in this simple narrative, has done more to make real the Egypt with which she deals than any other recent writer on the subject—and a proper comprehension of the Copts is needed if a right understanding of the Egyptian problem be desired.

Mr. Fyfe's book is of a different character. He deals chiefly with political questions which do not call for discussion here—it need only be said that he makes a valuable contribution to the study of the new Nationalist (Moslem) movement in Egypt. Mr. Fyfe, besides politics, gives rapid, incisive sketches of the aspect of the Delta, of Cairo and its people, and of a visit to Khartum. Possessing insight as well as a clear and attractive style, he thus provides that local setting which gives life to his dissertations on the methods and aims of the British and of the Nationalist parties.

Perhaps the most noticeable thing about Yacoub Pasha Artin's book is the fact that it is written by an Armenian who for many years held high ministerial office in Egypt. It is the first testimony to the benefits of British rule in the Sudan published in book form by an Egyptian official, and it makes very pleasant reading for Englishmen. A shrewd observer, and well versed in the history of the country, Yacoub Pasha was particularly interested in studying the divers types of Sudanese and the economic development of the country. The romantic scenery of the Blue Nile is also very well described. The pasha's notes upon the origin of the Sudanese are worthy of study. He reaches the conclusion that

the negro races are capable of achieving as high a degree of civilization as are the white races. The illustrations are of exceptional merit.

Morocco.

'The Khalifate of the West: being a general description of Morocco.' By Donald Mackenzie. *Maps and Illustrations.* London: Simpkin, Marshall & Co., Ltd. 1911. 10*s.* 6*d.*

An authoritative account of Morocco which should be also "up-to-date" is much to be desired; the standard books on the country were written previous to the signing of the Anglo-French agreement of 1904. Mr. Mackenzie's knowledge of Morocco extends over a period exceeding thirty years, and his survey is brought down to 1910. About a half of the book is taken up with a description of the country (physical features and towns), its peoples and commerce, and all this is of distinct value. In other chapters the tangled political situation is considered. Quite two-thirds of the Empire, the author states, is more or less independent of the Sultan, even in normal times. Of the aims and actions of France and Spain he writes critically, and he declares that British interests demand the continued independence of the country. He thinks the Berbers, who form the bulk and backbone of the population, capable of bringing again peace and prosperity to the land "under the influence of Christianity"; and of all foreign ameliorating agencies he holds that that most needed is the establishment of unsectarian schools where Western knowledge should be given to all comers.

In some respects the most valuable of Mr. Mackenzie's chapters are those in which he tells the tale of the Cape Juby settlement (1880–1896). It is a story of an enterprise that failed, but deserved to succeed; an enterprise recalling the days of the merchant adventurers who founded kingdoms. Of this enterprise Mr. Mackenzie was the originator and controlling spirit, and that Great Britain does not now possess a seaport on the Atlantic coast of Africa north of the Gambia is not due to any failure on Mr. Mackenzie's part. These pages do more, however, than record an interesting chapter in political geography; we have first-hand descriptions of a region still little known, a region without a present but with a past and with a future. It is regrettable that the map of the district given is on so small a scale as to be of little use. Mr. Mackenzie appends to the narrative of his experiences a remarkably precise and engaging account by Joachim Gatell of his adventures in and observations upon the Wadi Nun country (which is made to include Cape Juby) during 1862–65. This is now translated from the French for the first time. Another appendix consists of a translation (also for the first time) of Gerhard Rohlf's article on the identification of Sigilmâsa and Tafilet. Altogether the book, which has several good illustrations, makes a many-sided appeal to those interested in Morocco and its destiny.

F. R. C.

The Algerian Sahara.

'The Desert Gateway. Biskra and Thereabouts.' By S. H. Leader. London: Cassell & Co., Ltd. 1910. *Illustrations.* 6*s. net.*

Mr. Leader's book is not intended as a topographical but as a sort of spiritual guide to visitors to Biskra—the only tourist resort in the Sahara. Many persons who go thither with no particular interest in Arab life, history, thought, or religion speedily have that interest sharpened, and (as Mr. Leader says) there is little chance of finding out on the spot what one wants to know if one's visit be confined to a few days or weeks. He travels best who goes armed with knowledge. And

just such information as the ordinary visitor to Biskra would wish to gather concerning the people he will meet Mr. Leader provides in this well-informed and sympathetic sketch of Islam as viewed from the desert gateway. Nor is its usefulness confined to the tourist class; it forms a pleasing introduction to the study of the Mohammedan question generally.

AUSTRALASIA AND PACIFIC ISLANDS.

The Marquesans.

'Les Polynésiens orientaux au Contact de la Civilization.' A. C. Eugène Caillot. *Illustrated by* 159 *platinotypes arranged in* 92 *plates.* Paris: E. Leroux. 1909.

Having selected a very appropriate title for his book, the author proceeds to inform us in his preface that "Cet ouvrage n'est pas fait pour la foule: il suppose des connaissances que possèdent seulement de rares érudits qu'intéressent la critique et l'histoire de l'humanité dans ses épisodes les plus ingrats. En écrivant ces pages, je n'ai eu qu'une intention: celle d'apporter ma contribution, si minime qu'elle fût, au domaine de la science. *Laboremus.*" After reading this flourish we turn with expectation to the text to find that out of 281 pages, 99 deal with the ethnology mainly of the Marquesans, and the remainder are devoted to a chronicle of the war of Raiatea-Tahaa, a journal of a petty war which is of no especial interest. "La foule" will probably skip the latter, and it is not improbable that the "rares érudits" will merely skim, if they do not skip, the whole, since there is little if anything new, and the treatment is superficial from the point of view of serious students. In his fifth chapter the author gives statistics of the enormous and rapid depopulation of certain islands, and refers to various contributory causes, such as wars, famines, cyclones, syphilis, phthisis, and alcoholism; he himself offers the "purely philosophical explanation" that "it is the inevitable destiny of an inferior race to be absorbed or destroyed by a superior. The Polynesian race has made no progress; it has not brought the least contribution to the endeavours which humanity has made to ameliorate its condition; it must therefore give place to others who are of better worth and disappear; at its death civilization will lose nothing." The author is equally pessimistic about the methods of administration adopted by the French in their Polynesian islands, which he fears will eventually fall to "l'annexion Yankee." Some of the plates of scenery are of interest, but many of the views show nothing in particular; several plates illustrate ethnographical specimens in the author's collection, many of which are of interest, and a large number of stone adze blades are also illustrated. On plate liv. a figure, presumably of the author, has been inserted, which, being on a smaller scale than the rest of the picture, gives an exaggerated idea of the size of the altar.

'The New New Guinea.' By Beatrice Grimshaw. (London: Hutchinson. 1910. Pp. viii., 322. *Maps and Illustr.* 12*s.* 6*d. net.*) The style of this author has in it something of that of the special correspondent: her books are intended to provide entertaining reading, and are written lightly with that object. At the same time the present volume provides impressions of and information about British New Guinea and certain of the neighbouring islands, which cannot easily be found elsewhere; an unbiassed and unofficial description of the system of government, for example, illustrated by the writer's description of the methods of peacemaking as practised towards a menacing tribe, is bound to find interested readers. The writer makes at least as good use of her opportunities as any traveller can who sets out with no definite scientific object.

'The Fiji of To-day.' By J. W. Burton. (London: Kelly. *N.d.* Pp. 364.

Illustrations. 7*s.* 6*d.*) Though written from an absolutely opposite standpoint, this volume is at least as redolent as that just noticed of the strange atmosphere of the Pacific. We have here a writer imbued with a deep sense of the responsibility of the white man—not the missionary only, but the administrator and the trader—towards the native races (whether indigenous or Indian immigrant) under their protection. He recognizes to the full the necessity for the industrial and spiritual cultivation of the colony, and though the book bears on every page the hallmark of the mission, the former consideration is in no way subordinated to the latter; indeed, the foundation of an industrial institute is the earnest of the author's own practical endeavours. The volume includes a clear physical survey of the archipelago, and the author has studied the history of its people to good purpose.

'Empire Builders in Australia.' By Edith Ralph. (London: Fisher Unwin, 1911. Pp. viii., 252. *Map.* 5*s.*) This is a history of exploration and early colonization in Australia, starting with Captain Cook, and carrying the story as far as the establishment of representative government. It is of a popular character, though the absence of the usual appeal through the medium of coloured illustration comes as something of a relief. Moreover, there is more evidence than in some other works of this sort, of careful research into original sources, the results of which appear in many small details which add intimacy and intelligibility to the narrative, and there is a bibliography which might with advantage have been extended.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Water-waves.

'Waves of the Sea and other water-waves.' By Vaughan Cornish, B.Sc. London: T. Fisher Unwin. 1910. *Sketch-maps and Illustrations.* 10*s. net.*

In this work Dr. Cornish deals at some length and in a readable and popular way with water-waves of all known kinds, from the smallest ripple which dulls the face of a pond to the storm-waves of the open ocean.

A large amount of valuable information has been collected together, and every care appears to have been taken to include only reliable data; which is particularly difficult when dealing with the subject of waves, owing to the tendency to exaggerate dimensions. The book is well illustrated by photographs taken by the author, and is divided into three parts.

In Part I. "The size and speed of deep-sea waves" is dealt with, and the relations between wave length and period, wave length and fetch, height and fetch, are fully discussed; also the relation existing between the velocity of the wind and the height and velocity of the waves produced. In dealing with the recorded dimensions of waves, Dr. Cornish has been face to face with the difficulty arising from the absence of any accurate method of measuring such dimensions. In the absence of such he has had to compare carefully the information derived from many different sources, and obtained by different methods; he has also made the measurements himself, using the best method available, and thus has arrived at conclusions which must carry considerable weight. He concludes from the records examined that the largest waves in ordinary North Atlantic storms attain a height of 43 feet, and in exceptional storms, both here and in the South Indian ocean, attain and perhaps surpass 45 feet in height.

The swell which sometimes is seen to roll in on a shore owing to a storm at sea is dealt with in an interesting way; examples are given showing how,

by timing the intervals between the breakers as they strike the shore and the period during which the swell continues to roll in, an approximate idea may be obtained as to the distance away of the storm and its extent.

Attention is directed to the frequent occurrence of two or more sets of waves of different height and length at the same time and place, and it is shown that it is usual to have smaller waves superimposed on long swells during storms, with the result that a sort of composite wave is produced; and when the crest of the smaller wave happens to coincide with that of the longer swell the effect is to produce a wave of greater height than those immediately preceding or following. As this happens at regular intervals, depending on the relative dimensions of the waves of the two groups, it is no doubt the true foundation for the popular belief that every seventh wave striking the shore is an exceptionally big one.

The relation between wind velocity and wave dimensions is shown to be approximately constant; the velocity of the wind in miles per hour being about 2·05 times the height of the wave in feet. The velocity attained by the waves is shown to be always a little less than that of the wind producing them.

In Part II. the action of sea waves in transporting sand and shingle is considered. Dr. Cornish believes that wave agitation is effective in moving fine material as far as the edge of the continental shelf—that is, to about 100 fathoms. The laws governing the action of the sea upon its bed are dealt with soundly and in considerable detail. The determining effect of wave action on the direction of shingle transport is fully recognized; also the profound effect of what may be termed "opportunity" in determining the direction of movement of beach material. Dr. Cornish has considered this latter from the point of view of both wave and tidal action.

Part III. is devoted to stationary and progressive waves in rivers, and gives most interesting accounts of such waves under different circumstances.

The book is a valuable contribution to our knowledge of waves, and should be useful to all whose work or study brings them into contact with the sea.

J. S. O.

METEOROLOGY.

'Meteorology, Practical and Applied.' By Sir John Moore. Pp. 492. London: Rebman. 1910. *Diagrams and Illustrations.* 10s. 6d. *net.*

We are quite sure that Sir John Moore has succeeded in his object of making this second revised and enlarged edition of his book "a worthy exponent of modern meteorology." The work is finely illustrated, especially in regard to meteorological instruments, and as a general book of reference it must rank high. It only remains for us to draw attention to a few points as they have struck us in perusing the volume.

In discussing, on p. 369, the question of the effect of snow accumulations upon climate as studied by Dr. Alexander Woeikof, the author says, "Again, the air over a snow-covered surface will become extremely cold—first, because the snow cuts off from it the warmth of the ground; and secondly, because dry feathery snow is a good radiator of heat. Then, as there is but little dust in the air over a snow-covered country upon which the solar rays can act, these rays will be unable by themselves to thaw a deep snow covering." How, then, is it that the winter snow does melt in the northern parts of Europe, Asia, and North America? The reasoning, as it stands, is, we think, not sufficiently clear, for we are ignorant of any physical principle which would justify the assumption that the presence of dust is requisite for the heat of the sun to melt a covering of snow.

There are indications here and there through the book that Sir John Moore falls into the common error constantly being exposed by Mr. W. H. Dines, F.R.S., of supposing that anti-cyclonic conditions in winter are usually productive of intense cold in the British Islands. In point of fact, the temperature conditions that accompany an anti-cyclonic circulation of the atmosphere are very various, but as a rule not very far above or below the normal, and Arctic weather in the British Islands, decking our roofs with icicles, comes as a rule with quite a different type of conditions. It is true that the two "historic" frosts of the last quarter of a century, namely, November to January, 1890-91, and January to March, 1895, were associated in the main with anti-cyclonic conditions; but in both these cases the anti-cyclonic systems became established after the ground had been deeply covered with snow, and their persistence should be regarded as much an effect as a cause of the cold. It is noteworthy that for its combination of intense cold and intense gloom coincident with the very shortest days of the year, the month of December, 1890, was climatically the most formidable month experienced in London during the last quarter of a century.

In a text-book by the pen of a physician we should naturally expect to find the relation of climate and weather to disease discussed at some length. With regard to the seasonal prevalence of influenza, Sir J. Moore, on p. 412, says, "Certainly winter comes out very decidedly as the season of the year most favourable to the setting up of the disease; but we must remember that an epidemic, once developed, runs its course equally through all seasons of the year, of which fact the pandemics of 1580, 1781-82, 1831, 1832-33, 1836-37 are striking illustrations. We may conclude, then, that the prevalence of this strange disease is absolutely independent of season and weather—a fact which distinguishes influenza from epidemic bronchial catarrh." Now, the very concession that winter is most favourable to the setting up of the disease supports the contention that winter is the season when it is most frequent, and it is surely mere verbal quibble to say otherwise. We would not emphasize this point or question the authority of so eminent a physician as Sir John Moore, were it not that common experience seems to associate influenza with the first quarter of the year, the late winter or early spring quarter, January to March.

In the terminating chapter on the seasonable prevalence of pneumonia, the author discusses the nature of pneumonia, and shows that it should be regarded as a specific fever analogous in type, however different in its manifestation, to typhoid. In accordance with this view, he applies the term "pneumonic or lung fever" to pneumonia, and shows that the lung inflammation is simply the most prominent local symptom in the general constitutional disturbance (blood infection), in the same way as the intestinal inflammation is the principal local manifestation in enteric or typhoid fever. In either case it is a grave and dangerous error to regard the febrile disturbance as secondary to or symptomatic of the local inflammation. L. C. W. B.

GENERAL.

German Colonies.

'Das Deutsche Kolonialreich.' Herausgegeben von Prof. Dr. Hans Meyer. Zweiter Band: Togo, Südwestafrika, Schutzgebiete in der Südsee und Kiautschougebiet. *Maps, Plans, and Illustrations.* Leipzig and Vienna: Bibliographisches Institut. 1910. 15*m*.

The second (and final) volume of this systematic account of the German Colonial Empire maintains the authoritative character which distinguished the

first volume (see the review in the *Journal* for September, 1910). Dr. Seigfried Passarge deals with Togo, and Prof. Leonhard Schultze with German South-West Africa. The survey in each case includes a general historical sketch, a detailed study of the country (geography, hydrography, climate, fauna and flora) and economic and ethnological divisions. In the case of South-West Africa there are separate sections to each region, *e.g.* the coast lands, Damaraland, the Kalahari. Dr. Passarge prefaces his description of the people of Togo by an excellent summary of the history of the native races and kingdoms of the West Sudan.

The account of the islands of the Pacific owned by Germany, written by Prof. Wilhelm Sievers, is divided into five main sections: (1) a general introduction; (2) Micronesian possessions—the Carolines, Marshall islands, etc.; (3) Melanesia—German New Guinea, the Bismarck archipelago, and the Solomon islands; (4) Samoa; and (5) economics. Kiau-chou is treated by Dr. Georg Wegener in the same thorough manner as are the other protectorates.

As in the case of the first volume, appended to the main narratives are technical accounts by experts, such as Dr. W. Koert, Prof. Hans Maurer, and Prof. A. Engler, on geology, meteorology, flora, ethnology, etc., and each subject so treated has its special map. The bibliographies form another valuable feature of the work; that on South-West Africa has 124 entries, that on the South Sea islands 343. These do not include historical treatises.

Besides maps, plans, and diagrams, there are numerous illustrations showing types of people, places, and scenery (the last often depicting remarkable formations). There are also six coloured plates.

In the Asiatic, as in the African sections of the volume, the historical summaries, though they go back to the era of discovery, are a little bald. The writers do little more than glance at the keen international struggles which the territorial ambitions of Germany occasioned. No hint, for instance, is given of the manner in which Prince Bismarck "behaved very shabbily" to Lord Granville over the annexation of Kaiser Wilhelm's Land. Prof. Schultze, moreover, closes his narrative of events in South-West Africa with the year 1892. The modern period—including the Herero and Hottentot wars—thus goes unchronicled, the writer justifying his reticence with the reflection that it is too soon for the historian to form a just estimate of these times. But in describing the economic condition of the country, Prof. Schultze writes of "the catastrophe of 1904," and there are other indications that he regards the Herero war as resulting from a misunderstanding by the Germans of the character of their opponents. The Hottentots are not so sympathetically dealt with.

Prof. Hans Meyer, the general editor, and the Bibliographisches Institut are much to be congratulated upon the completion of this important work. The information is brought down to the year of publication, and (save on the historical side) there appears to be little of general value known about the German colonies which is not given in its pages.

F. R. C.

'Politique Musulmane (Revue du Monde Musulman).' By A. le Chatelier. Paris: Leroux. 1910. Pp. 165. *Maps and Illustrations.*) The purpose of this publication is political, but it affords a survey of the present geographical extent of the Mussulman world, which is illustrated by sketch-maps, as also are the Arab conquests and other facts of Mussulman history. The characteristics of the people are studied both as a whole and in the various countries through which they are distributed, and the volume is illustrated with some excellent photographs and sketches of Mussulman types, architecture, and art.

'The Life of the Rt. Hon. Cecil J. Rhodes.' By the Hon. Sir Lewis Michell. (London: Arnold. 1910. Two vols., pp. xv., 342; xi., 342. *Illustrations.* 30*s.*) This important biography, although abundant in reminiscences of the personality of Rhodes, is concerned almost exclusively with his public career. On this, and therefore on the making of British South Africa as far as Rhodes carried it, the writer's position enables him to speak with the highest authority.

'Colonies Portugaises. Les organismes Politique Indigènes.' Par A. L. de Almada Negreiros. (Paris: A. Challamel. 1910.) Senhor Negreiros is a recognized authority on the Portuguese colonies, which he has studied from many standpoints. In this volume he sets forth, mainly by quoting official documents, the views held by Portugal with regard to the management of native races. So far as the making of laws goes Portugal has from the sixteenth century onward chosen the right path. The author attributes the success of Great Britain and Holland as colonizing powers to their having copied, and bettered, Lusitanian methods. The first part of his volume, historical and retrospective, is full of quaint information, and bears evidence to the enthusiasm and thoroughness with which Senhor Negrieros studies his subject. The second part, devoted to an exposition of the existing *régime*, is less satisfactory. The irreproachable correctitude of the paper regulations affords no conviction to the mind, and we feel that we are the victims of calculated economy when in the chapter on Angola we find no mention of the recruitment of labour for the São Thome cocoa plantations, but are fobbed off with a statement that the Boers in Angola act towards the natives in flagrant opposition to the lofty conception entertained by the Portuguese of their civilizing and humanitarian mission.

'Vasco da Gama and his Successors.' By K. G. Jayne. (London: Methuen. 1910. Pp. xix., 325. *Map and Illustrations.* 10*s.* 6*d.*) This volume is an important contribution to the study of the imperial history of Portugal in the sixteenth century. Its geographical interest centres mainly upon the first four chapters, in which the work of Prince Henry the Navigator and the navigators preceding da Gama is briefly outlined, and upon the next five, which deal with da Gama's first and second voyages. The details of the first voyage are fully worked out, with frequent reference to original sources, and the critical bibliography which forms an appendix to the work is a valuable addition. In the remainder of the book the Portuguese administration in the East, Judaism and the Church, art and literature (with particular reference to Camoens), and the period of decline are successively dealt with. A chronological table and a full index, besides the bibliography mentioned, add to the utility of the book for reference, while in his style the writer makes good use of vivid colouring, though this use betrays him once, when speaking of the currents in the Indian ocean.

'The Nations of the Modern World.' By H. J. Mackinder. (London: Philip. 1911. Pp. xvi., 319. *Maps and Illustrations.* 2*s.*) This volume completes a series of four "Elementary Studies in Geography." In the main it may be defined as a geographical history—"a book of mingled geography and history," as it is called in the preface—and Mr. Mackinder's treatment of subjects on these lines is too well known to need description. But the book also makes great use of studies in contrasts—development of lines of communication and economic resources during the past century, and other such suggestive topics, which are illustrated by such pictures as the steamers *James Watt* and *Mauretania* side by side, and by comparative maps. The author directs the attention of teachers to the maps, and the necessity of as much care in reading them as is given to the text.

THE MONTHLY RECORD.

EUROPE.

Old British Shore-lines.—In addition to the shore-lines due to oscillations of level during or after the Glacial epoch, it has for some time been recognized that an old shore-line of still earlier date, altogether older than the Ice age, is traceable in Great Britain. The first evidence in this direction was supplied by Mr. Lamplugh's investigations at Flamborough head, described by him in 1888, since which date the researches of various observers have demonstrated the existence of a pre-Glacial shore-line at a number of points round the southern part of the British Isles, south of an east-to-west line running through Yorkshire, the Isle of Man, and County Mayo. The question is of much importance in connection with the subject of the permanence or temporary character of the deformations to which the crust was subject in the Ice age, since by the determination of the pre-Glacial sea-level we have a datum to which all subsequent oscillations can be referred. It is, therefore, a matter of interest that within the past few years data have been obtained from the western islands of Scotland which show that traces of old beaches of earlier date than the Ice age are to be found even in the northern parts of Great Britain. The discovery of a pre-Glacial platform of marine erosion in the isle of Colonsay was made in 1907 by Mr. W. B. Wright of the Geological survey, and further research with the aid of a Government grant from the fund administered by the Royal Society has shown that the shore-line may be traced in the adjoining islands also. Mr. Wright briefly describes the results of his investigations in the *Geological Magazine* for March, 1911. While the pre-Glacial beaches round the southern parts of these islands have proved to have an almost uniform level, but slightly above present high-water mark, indicating that no marked permanent dislocation has taken place over the area in question since pre-Glacial times, the similar beaches in the north are found to stand at heights varying from 90 to 135 feet above sea-level, and the problem is therefore more complex than has been supposed. In Colonsay and Oronsay the remnants of an old plain of marine erosion form one of the most remarkable physical features of the islands, and its inner margin, marked by a line of lofty cliffs, can be traced in many places. A remarkable fact is its comparatively slight modification by post-Glacial denudation. In these and neighbouring islands this old cliff and platform are continuous along stretches of coast many miles in extent, and as the platform maintains a uniform level independent of, and often in spite of, the rock structure, there can be no doubt that it represents an old shore-line. The position of the newly-found beaches relatively to the later beaches grouped roun1 a centre in the Scottish Highlands is of interest. They occur well within the area of the 100-foot late Glacial beach, while within the same area no traces of the lower pre-Glacial beach of Southern Britain occurs. From this fact, and from the sudden manner in which the 100-foot beach disappears at the limit of its area, Mr. Wright ventures the suggestion that the same movement which brought the 100-foot late Glacial beach into its present position was also responsible for the elevation of the pre-Glacial beach in the western islands.

Grouping of Population in Northern Catalonia.—A brief but instructive study of this subject is contributed to the *Annales de Géographie* (January 15, 1911) by M. Maximilien Sorre, who had previously dealt in the same way with a portion of Southern France (*Journal*, vol. 30, p. 209). Northern Catalonia, including the upper basins of the Llobregat, Ter, and Segre, and the basins of

the Fluvia and Muga, presents great diversity in the grouping of its population, and the ordinary terms denoting the two broad types of distribution—agglomeration and segregation—do not suffice to express the facts. It is necessary to distinguish the scattered population in its strictest sense (excluding that of the hamlets even) from that grouped in centres of however small a size. A study of the various types distinguishable between the plain and mountains of Northern Catalonia shows that the scattered population is small in the plain, comparatively large in the middle region, and lower again in the mountains; while the population of the centres of over 100 inhabitants follows the reverse proportions. These facts are closely bound up with the geographical conditions. The fertile plain, well populated as it is, cannot, owing to the deficiency of the water-supply, be inhabited at all points, and a number of centres of moderate importance is the result. The wide valleys of the middle region, with a good water-supply everywhere, are specially favourable to wide dissemination, the scattered population (dwelling in isolated farmsteads) reaching a quarter of the whole. In the hilly region of moderate elevation known as the Garrotxa, with its diversity of soil and relief and irregular distribution of water-supply, the conditions determine a grouping in certain localities like the *pla* or mountain saddle, the hollow in the midst of calcareous strata, or generally any widening of the upper valleys. We find a multiplication of hamlets, which more nearly approach the importance of the principal centres. In the still higher region—the Cerdaña—the difference in size between the settlements becomes still less. A study of historical documents shows that there has been in course of time a general progress towards concentration, though the movement has differed in the three zones above described. M. Sorre finds that the facts bear comparison with those observed in the plain of Languedoc and the Cevennes.

Valley Winds in Switzerland.—The numbers of the *Meteorologische Zeitschrift* for October and November, 1910, contain three articles on the above subject, which may here be noticed together.* The Föhn wind is, as is well known, a hot descending valley wind, dried and heated adiabatically in its descent; and Dr. Ficker shows in his article that Bilwiller's theory of its origin holds the field. When a cyclonic depression passes over the Alps, the general ascending movement of the atmosphere, which is always the product of cyclonic action, has the effect of sucking up the air confined in the deep mountain valleys situated on the lee side of the chain, and this must inevitably result sooner or later in a somewhat violent precipitation of air into these valleys to restore equilibrium as the general southerly wind current in front of an eastward-moving cyclone travels horizontally across the chain. Dr. Ficker recognizes three stages in a fully developed Föhn, and shows that prior to its formation the upper air is relatively warm and dry as compared with that in the valley bottom, there being often an actual temperature inversion, and it is when this cold valley air flows away that the Föhn "breaks." The Maloja wind of the Upper Engadine, discussed by Dr. Heuer, presents the anomaly of being in one part of the valley a rising wind, and in another part a descending wind (but not a Föhn). In the third article Dr. Hann rejects Heuer's explanation of the Maloja wind, and discusses the theory of rising valley winds in general, such as are normal to Swiss valleys during the warmer hours of the day. He affords good evidence to show that the main cause of the rising wind is not

* Dr. H. v. Ficker, "Ueber die Entstehung der Föhnwinde auf der Nordseite der Alpen;" Dr. W. Heuer, "Ueber die Ursachen des Malojawindes;" Dr. J. v. Hann, "Zur Theorie der Aufsteigenden Talwinde."

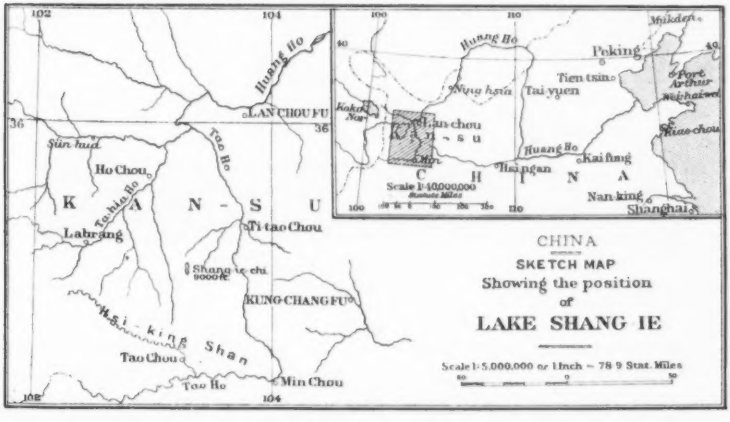
the higher temperature of the air on the sunny side of the mountains than that in the free atmosphere at an equal height, although this does play a subordinate part, but considers it to be connected with an elevation of the surfaces of equal pressure in the free atmosphere around mountains consequent upon the heating in the plains, the increased pressure in the atmosphere causing the air to flow towards the mountains, which thus seem to draw such masses of air towards them. With respect to the effect of the sun's rays in heating the strata of air over horizontal surfaces, upon which he bases his theory, Dr. Hann writes, "Die ganze Luftmasse über die Fläche bläht sich sozusagen mit steigender Temperatur auf, in allen Höhen steigt der Druck, was ein Abfliessen der Luft in der Höhe gegen eine benachbarte kühlere Umgebung zur Folge hat. In weiterer Folge führt das bekanntlich dann zu einer Drucksteigerung im kühleren Gebiete und einem Einströmen der Luft in den erwärmten Raum an der Erdoberfläche." But does this preliminary rise of pressure take place over a heated area before the well-known expansion of air and consequent reduction of pressure takes place? The writer of this notice was asserting this dogma somewhat vigorously in *Symons's Meteorological Magazine* for May, 1904, when his attention was quickly directed by the editor to a mathematical investigation by Mr. W. H. Dines, F.R.S., which had appeared in the same magazine for July, 1901, purporting to show that when a mass of air is heated in the free atmosphere, the inertia of the surrounding air acts like a containing vessel with a large hole in it, so that the heated air undergoes no perceptible increase of pressure, but after a small oscillation of pressure, lasting a few seconds, immediately commences to expand, rise, and overflow with consequent diminution of barometric pressure over the heated area. We know that when a mass of any gas is heated it will expand against external pressure if it can, and so become reduced in density and consequently in pressure, but that if it cannot expand, its pressure will rise; similarly, when cooled it must either contract with increase of density and pressure, or become reduced in pressure. It is of fundamental importance to the meteorologist to form a clear conception how masses of air behave in the *free atmosphere* when subjected to changes of temperature, and in all physical problems of this nature mathematical analysis has more claim to consideration than mere verbal reasoning, because figures stand rigorously for the facts they refer to, and one cannot play with them as one can with words.

The Saint-Anna Lake, Hungary.—This is a small lake without outlet occupying an extinct volcanic crater in the Hargitta mountains of Transylvania. It presents features of considerable interest, though only lately examined for the first time with any care from a scientific point of view by Dr. J. von Gelei, who describes his visit for the purpose of sounding the lake in the *Bulletin* of the Hungarian Geographical Society, International edition, vol. 37, pp. 97–118. With the neighbouring Mohos lake, the St. Anna lake occupies a position on the line of old volcanoes which were already active at the time of the Lower Cretaceous, but which seem to have only become extinct in comparatively recent geologic times. It forms a picturesque object, surrounded as it is by steep wooded slopes, which form, however, a comparatively low saddle on the side towards Lake Mohos, though reaching elsewhere a maximum height of 1000 feet. The sounding operations, as well as the survey of the lake's outlines, were carried out with great care, though the means at Dr. von Gelei's disposal were somewhat primitive. In the absence of a boat a raft was used, but this sank so deeply when the wood became saturated that the observer was finally standing up to the knees in water. The positions of the soundings were fixed by means of a marked rope, over 500 yards in length, which was stretched across the lake

in successive parallel positions at intervals of about 30 yards, the total number of soundings being 655. The shallowness of the lake, which has the shape of an artist's palette, is remarkable considering the steepness of the surrounding slopes, the greatest depth, in the broader southern portion, being only 27 feet. The bottom is for the most part covered with so thick a layer of decayed vegetable matter that it was almost impossible to determine the precise moment at which the lead touched it. The water is of remarkable purity, almost equalling distilled water in this respect. The temperature of the water was found to stand some 3° C. (5·4° Fahr.) higher round the shores than in the centre: owing to its chemical purity the water is warmed by convection from the bottom, not by direct radiation from above. It is a popular belief that currents set from the periphery to the centre, but by the use of an ingenious device Dr. von Gelei proved that this was not the case, but that they always followed the direction of the wind. This is generally from the east, though the upper current of the atmosphere is in the opposite direction: it is reversed on striking the steep crater wall. At times the wind was seen to strike the water in the centre only, and at others to disturb the surface all round the circumference while leaving the centre calm. The paper includes interesting observations on the freezing, and nature of the ice, of the lake.

ASIA.

A Mountain Lake in Kansu.—Mr. David P. Ekvall, one of a band of missionaries labouring in the extreme north-west of China proper, sends us a brief account of a mountain-girt lake lately visited by himself and a colleague on the borders of Kansu. The lake, which he regards as a new discovery, lies



at an elevation of 9000 feet in the midst of the great range separating the basins of the Hwang-ho and Yangtse, and variously known by the names Chongnan-Shan, Siking-Shan, Tsinling-Shan, etc. A first visit to the lake, during the summer of 1909, permitted the exploration of a small part of it only, owing to the dense undergrowth which covered the precipitous banks. Mr. Ekvall revisited the lake last winter in company with his son, and finding it frozen solid, and being provided with skates, explored it throughout its whole length of 3 to 4 miles. The lake has no outlet unless by subterranean passages. Shang-ie-chi, as the lake is known to the inhabitants of the country, is regarded

as a sacred lake, and the tutelary deity whose name it bears is venerated as one of the seven associates of the Chinese Neptune or Dragon god. It is believed that he dwells in a palace at the bottom of the lake, and that he can be propitiated by offerings of silver thrown into its water. Evil consequences were seriously believed to have resulted from the removal of some of these offerings

LAKE SHANG-IE, KANSU.
(*David P. Ekvall, photo.*)

during a time of unusually low water. The ascent to the lake involves a steep climb of 5 miles, but a visit in summer well repays the trouble. The journey was continued south to Tao-chou, and the return was made through a wild, little-known country *vid* Ho-chou to Lan-chou, and thence to Titao-chou, which is apparently the place of residence of the missionaries. It led through a gate in the Great Wall, to the north of which some fine grazing-land, with tens of thousands of cattle and sheep, was passed. Before entering the Hochou valley the main range was crossed at an elevation of 13,000 feet, the highest peaks of the Taitze-Shan, or Prince mountain, rising several thousand feet higher. The accompanying view of the lake reproduces a photograph taken by Mr. Ekvall, and the map is from a rough sketch sent by him to show its approximate position.

Recent Journeys in North-Eastern Arabia.—In Captain G. E. Leachman's account of his journey in North-Eastern Arabia, printed in the March

number of the *Journal*, the claim was made, in a footnote on p. 265, that the Wadi-el-Khar (important in connection with the water-supply on the route between the Jauf oasis and Nejef in the Euphrates basin) had been discovered by the author. The note was evidently written in ignorance of the fact that that wadi had already been discovered in 1909 by Prof. Musil, whose latest journey was briefly described in the *Journal* for May, 1910 (vol. 35, p. 579). In the sketch-map there given the wadi appears under the name of Al Herr—the correct form according to Dr. Musil. The Austrian traveller's routes lay some distance to the west of Captain Leachman's, but a portion of them comes within the area covered by the latter's map, in which they should therefore have been included.

Mrs. Milne's Book on the Shans.—In the notice of this book in the April number, p. 437, reference is made to the supposed absence of a map. This, we find, was a mistake on the part of the reviewer, who apparently overlooked the map contained in the volume, which, though not on a large scale, suffices to orientate the reader as to the region under consideration.

AFRICA.

The Silt of the Nile Flood.—The *Cairo Scientific Journal* for February, 1911, contains a note by Mr. Frank Hughes on the amount of silt carried by the Nile during the floods of 1908 and 1910. Although the clemical composition of the silt has been made the subject of exhaustive study, but few data exist concerning the physical composition, and the variation in the amount carried by the river at different points. Mr. Hughes has examined, in addition to surface samples, a number of samples from various depths in the river, at Cairo and also from other parts of the river. He has also examined the water of some canals in order to find what proportion and what part of the suspended matter reaches the land under the present system of perennial irrigation, and concludes that the deposit which reaches the land under the present system has a tendency to form a heavier soil than that which would be obtained in the "basin" system. It appears that, except where the river is flowing through a contracted portion of its channel, the bottom samples show an amount of silt in excess of that of the surface samples by about 10 per cent. only. The effect of local scour due to a sudden contraction in the bed of the river is shown very clearly by samples taken at Bulaq and near Rosetta, the surface sample at the latter place exceeding any other surface sample taken during the flood by more than 10 per cent. Below the Delta barrage the results for the suspended matter at the surface are higher than at Bulaq, by reason either of more thorough mixing of surface and bottom water, or of local scour on the down-stream side of the barrage.

Changes in the Contours of Stanley Pool.—Apart from the variations in the map of Stanley pool brought about by improved surveys, considerable actual changes in the contours of the pool and of Bamu island seem to have come about since its first discovery by Stanley thirty-four years ago. An article in the *Mouvement Géographique* for April 16 last draws attention to these, which are illustrated by three sketch-maps, two of them giving the contours according to Stanley in 1880 and according to the most recent maps, the third showing the probable state of things in the not distant future according to Dr. Paul Briart, who supplies the greater part of the article. The changes are said to be not only of the nature of constant modifications in the contour of the banks and islands due to action of the rising and falling waters, but of permanent gains to the land surfaces at the expense of the water-area. This latter is ascribed to the slow but steady wearing down of the rocky sill which creates

the first cataract, and it is held that in course of time the greater part of the area of the pool will be occupied by an enlargement of Bamu island, while of the two arms of the river by which this will be surrounded, that on the northern or French shore is thought to be destined to disappear, leaving a simple well-defined channel on the Belgian side. It seems doubtful how far Dr. Briart is justified in thinking the wearing down of the sill to be rapid enough to have brought about the observed changes in so short a time, and it might be thought that the deposition of sediment alone might suffice to explain the facts. He also seems hardly correct in ascribing the double rise and fall of the river to the extension of its basin on both sides of the equator, the double rise and fall being normal to the equatorial zone, while the wide extension north and south might be supposed to operate in the direction of equalizing the flow in the central artery. In any case the removal of the main port of the Pool from Léopoldville to Kimpoko, or some other point further removed from the dangerous neighbourhood of the first cataract, would seem advisable on many grounds, as has been urged for some time by those best qualified to judge.

Distribution of Population in Madagascar.—On the basis of the latest official figures, Lieut. E. de Martonne discusses the main features of the distribution of population in Madagascar in the *Annales de Géographie*, January 15, 1911, showing also the different degrees of density by means of a sketch-map. The unit of area on which the latter is based is the district or sector—the subdivision of the provinces into which the whole island is divided. While some of the districts show densities of only 0·5 or less to the square kilometre (1·3 to the square mile), others have more than 20 (50 to the square mile), while if a smaller unit of area had been chosen, the figure would reach 100 to 150 to the square mile for the areas adjoining important centres. The four provinces of the high plateaus, peopled by the Merina (Hovas), Vakinankaratra, and Betsileo, show the greatest general density—almost all their districts having more than 25 inhabitants to the square mile. Another thickly populated region is that extending along the east coast from Tamatave to Vangaindrano—the Betsimisaraka country, with enclaves of the Antaisaka and Antaimorona to the south. These are so well peopled as to furnish the principal element in the movable labour-supply of the island. The dense population of the plateaus is virtually enclosed by the contour of 1000 metres (3300 feet), and altitude—coupled with the rich character of their alluvial basins and valleys, which permits the cultivation of rice on a large scale—is the prime factor in the case. The fertility of the Betsimisaraka country seems the cause of its dense population. By contrast with these areas, the south, west, and north-west of the island (the Bara-Sakalava countries) are a desert.

AMERICA.

Glacier Studies in Alaska.—We are informed that the Research Committee of the National Geographic Society of Washington has made an appropriation of $5000 for continuing the glacier studies of the two previous years in Alaska. The work, beginning in June, 1911, will be done by Professor R. S. Tarr, of Cornell University, and Professor Lawrence Martin, of the University of Wisconsin, who directed the National Geographic Society's Alaskan expeditions of 1909 and 1910 in the Yakutat bay, Prince William sound, and lower Copper river regions. The 1911 expedition will study briefly a number of regions of glaciers not previously investigated by the National Geographic Society, although partially mapped by the Alaska Division of the U.S.

Geological Survey, the Boundary Commissions, etc. Work will be done on the present ice tongues and the results of glaciation in the mountains and plateaus of parts of the interior as well as some of the fiords of south-eastern Alaska, the former having lighter rainfall and smaller ice tongues than the Yakutat bay and Prince William sound regions.

Dutch Exploration in Guiana.—Of the series of exploring expeditions by which the Dutch authorities have for the first time elucidated the geography of their colony of Surinam, the latest, originally placed under the command of Lieut. Eilerts de Haan, had as its task the exploration of the western interior of the colony, between the upper Surinam and the Corentyn. Lieut. de Haan had done previous work of the same kind (cf. *Journal*, vol. 32, p. 410), and in 1909 had come upon a new river, beyond the upper basin of the Surinam, which was named the Lucie. The expedition was instructed to trace this river down to its termination, it being thought most probable that it would prove to be a branch of the Corentyn. Unfortunately the leader soon succumbed to malarial fever, his place being taken by Lieut. Kayser, assisted by Dr. Hulk, the medical officer of the party. Among other items of news given from time to time in the *Tijdschrift* of the Netherlands Geographical Society, a series of letters from Dr. Hulk is printed in the issue for March of this year. They cover the period of the death of the leader and the subsequent advance, in October, 1910, from the last camp on the Surinam to the Lucie river. The news has since been received (*Petermanns Mitteilungen*, No. 4, 1911, p. 195) that the expedition has successfully carried out its task, having followed the Lucie river down to its junction with the Corentyn and made its way back to Paramaribo. The tributary thus traced across the large area in the western interior of the colony that has hitherto remained a blank in our maps, is that known at its junction with the Corentyn, just north of lat. 5° N., as the Kabalebo. By the series of explorations thus brought to a close (several of which have been referred to from time to time in the *Journal*), the broad outlines of the map of Dutch Guiana have at last been completed.

AUSTRALASIA AND PACIFIC ISLANDS.

Mr. Staniforth Smith's Expedition in Southern New Guinea.—Reference was made in the April number (p. 453) to the return of the exploring expedition undertaken in November last by the Administrator of Papua, the Hon. Staniforth Smith, into the unknown area forming the bulk of the western division of Papua (British New Guinea). Further details have since been received in this country, showing that the expedition has had unusually important results from a geographical point of view, being, as is claimed, the longest overland expedition in unknown country ever accomplished in the Territory. It has for the first time thrown light on the physical features of the largest area previously unexplored in the whole island, occupying the widest part of the British territory, north-west of the Gulf of Papua and east of the Fly river basin. The expedition was suggested by the reports of coal brought home by the Mackay-Little expedition,* and it had been intended to enter by the Purari and push west beyond the farthest point reached by that expedition. This plan was, however, modified, and the Kikori river, west of the Purari, was chosen as the line of entrance, the party striking overland from it to Mount Murray (8000 feet), a little to the west of Messrs. Mackay and Little's farthest. It was hoped to go west from this, and, cutting the courses of the Omati,

* We hope to publish shortly an account of this expedition, which was briefly referred to in the *Journal*, vol. 33, p. 93.

Turama, and Bamu rivers, to reach the coast at the mouth of the Fly. The explorers were, however, compelled by the direction of the mountain ranges and the rough nature of the country to take a north-westerly direction, and as the limestone ranges continued almost to the position of the headwaters of the Strickland (the eastern tributary of the Fly), they found themselves on January 23 on the banks of a large river in lat. 6° 20′ S., which they took to be the Strickland. It was running through a gorge 1200 feet deep, and could not be crossed, so it was decided to make rafts and descend the stream (the supposed Strickland) to Kiwai island at the mouth of the Fly, where it had been arranged that the *Merrie England* should await the expedition. Rapids were found to extend for 120 miles, and in these the rafts were overturned and all the impedimenta lost, necessitating a journey of 300 miles through unknown country without tents or other necessaries. It was, however, successfully accomplished in thirty-three days, the river whose course had been struck proving to be the Kikori, which thus rises in the main range of New Guinea, and in its upper course is only 6 miles east of the Strickland. It will thus rank with the largest rivers of the whole island.* The expedition is said to have travelled on foot through new country a distance of 374 miles, and by raft 150 miles—520 miles in all. Like Messrs. Mackay and Little, Mr. Smith found the country indescribably rough, the mountain ranges consisting of huge masses of jagged and precipitous coral limestone, while the valleys were also covered for the most part with masses of coral wedged together. Although heavy rains were experienced daily, the party was frequently without water, as the rain sank through the porous rock as through a drip-stone filter. Besides a cluster of villages at Sambrigi, north-west of Mount Murray, only one village of any size was seen. By the exercise of great tact friendly relations were established, and assistance was obtained from the natives. The variety of physical types seem to indicate an admixture of various stocks, some showing the Semitic cast of countenance, others a light skin like the Samoans, and others again approaching the coastal type. Sago formed the staple food up to 3500 feet, and above this sweet potatoes; the wild pig, plentiful everywhere, yielding the main meat-supply.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Types of Volcanic Eruption.—To the main types of volcanic eruption usually laid down by experts in the subject, Dr. Hans Reck claims, as a result of his detailed studies of the volcanoes of Iceland, to have added one not hitherto recognized as existing. In his memoir on 'Isländische Massenerruptionen,' forming one of Koken's *Geologische und Palæontologische Abhandlungen* (N.F. Band 9, Heft 2; Jena, 1910), and in other papers, he maintains that the remarkable class of volcanoes to which the name shield volcanoes (from their characteristic form) has been applied, are not in any way connected with fissures or lines of weakness in the Earth's crust, but represent the piercing of that crust by molten matter at independent points. These shield-volcanoes rise from a roundish base, with a gently convex surface surmounted by an elevated ring surrounding the crater. They are, Dr. Reck holds, to be classed—no less than the fissure-eruptions with which alone the idea is usually associated—

* One of the main mouths of the Kikori is the Aird river, so named by Captain F. P. Blackwood during his survey on the south coast of New Guinea in 1845. The lower course was ascended by Mr. Theodore Bevan in 1887, and by Sir W. MacGregor in 1892.

as massive eruptions, being due to the welling out of a fluid magma all round the orifice of the crater, without the intervention of explosive phenomena of any kind. One of the most remarkable of the class in Iceland is the Herdubreid, which rises as a rectangular, precipitous-sided horst, some 4000 feet above the lava-plain of Odadahraun. Dr. Reck succeeded in making the first ascent of the mountain (which is only possible at a point where the bounding wall is breached by a ravine), and was able to prove conclusively that it belongs to the class of shield volcanoes, though its outward appearance is such as to have caused doubts as to its being a volcano at all. Its present form has been due to a recent general subsidence of the surrounding area, leaving the palagonite tuff which underlies the lava-cap exposed to view for a considerable depth. From the arrangement of these volcanoes in a more or less linear zone curving through the island from the north to the south-west, they have been thought, by Thoroddsen and others, to occur along lines of fissure; but though the same zone shows many examples of true fissure eruptions (also discussed in the memoir), Dr. Reck maintains that not one of the shield volcanoes is in any way connected with a fissure—a fact which can be absolutely established in the case of the Herdubreid, owing to the clean exposure of all its four faces. The table-like form of this and similar volcanoes is due to the relative solidity of their lava columns, which have offered resistance to the subsidence by which the neighbouring area has been affected. A comparison of the shield volcanoes of Iceland with the Hawaiian type leads Dr. Reck to the conclusion that the two are analogous in all essential characters, though in the case of the latter the outer form has been greatly modified. Objection to Dr. Reck's view has been raised in the *Geological Magazine* (1910, p. 392) by Prof. E. H. L. Schwarz, who gives an example from South Africa of the healing of an original fissure, which he thinks may have taken place in the case of Herdubreid. But in a subsequent note (*Geol. Mag.*, 1911, p. 59) Dr. Reck shows that the suggestion will not hold good. He certainly seems to have proved that no actual fissures occur in the immediate neighbourhood of the shield volcanoes, though whether he is justified in denying their connection even with a line of weakness in the Earth's crust seems more doubtful. Among the phenomena discussed, and illustrated, in the memoir, that of the remarkable lava "plugs" rising from the surface of the southern lava-fields deserves mention.

The Glaciation of the Sea.—In a paper read last year at the Basel meeting of the Helvetic Society of Natural Sciences, and since printed in a French translation in the *Archives des Sciences* of Geneva, Prof. von Drygalski discusses the question of the glaciation of the sea during the glacial epoch in the light of facts observable in the Polar regions at the present day. The particular point kept in view is whether the evidences of glaciation to be found on either side of inlets like the Norwegian fiords, or of seas like the Baltic or Baffin bay, justify the conclusion that the whole depression can have been entirely filled by ice at a period of maximum glaciation, supposing the land-level to have been then the same as it is now. The answer depends naturally on the thickness to which an ice-sheet may be supposed to have attained at the period in question, for in order to entirely fill a sea of a given depth the ice must reach a thickness varying from $\frac{1}{4}$ to $\frac{1}{5}$ greater than that depth. Thus, in order to pass over Baffin bay into the northern parts of North America and produce the glaciation there observable, the Greenland ice-sheet would need to have a thickness of 2000 metres—a thickness which, the writer holds, it is most improbable that it can ever have attained. In fact, he maintains that the Norwegian fiords are too deep to have ever been filled by an inland ice-sheet. The conditions of formation

of sea-ice—whether sea-ice proper or icebergs—are considered in regard to the possibility of an eventual growth in thickness sufficient to fill depressions similar to those named above. Blocks of sea-ice may increase by the addition of snow, but only, it is pointed out, to a limited extent, when sheltered from the action of the wind, which prevents icebergs from gaining in height by this means. At the same time their lower portions are likely to be disintegrated with the increase of hydrostatic pressure as the ice sinks by addition to its weight. Greater accumulations can only arise from the configuration of the land or sea-floor, the former (as in many of the Greenland fiords) offering obstructions to the passage of icebergs out to sea, the latter (as in the case of the "shelf-ice" bordering parts of the Antarctic lands) holding the ice stranded in the more or less shallow waters of the continental platform. In these ways the Norwegian fiords, or a shallow sea like the Baltic, could, no doubt, be entirely glaciated, but there can be no question of the Antarctic ice having ever, since far earlier geological times than the last glacial epoch, crossed the deep seas surrounding the southern continent so as to exercise any influence on the lands to the north. Prof. von Drygalski may perhaps be thought to deny too categorically the possibility of ice-sheets greater than that of the present Antarctic continent having ever existed, though his conclusions are no doubt in the main sound.

GENERAL.

The Proposed Monument to Richard Lander.—With reference to the proposed monument to Richard Lander at Forcados, West Africa (May number, p. 570), it should be stated that there is a monument to Lander, erected in 1852, at his birthplace, Truro, Cornwall; a fine, lofty granite column, bearing on its summit a statue of the illustrious discoverer. At the same time it is felt that there ought to be a monument on the continent where he accomplished his great work, and on which he died.

CORRESPONDENCE.

Hannibal's March.

Mr. Douglas Freshfield, whose intimate knowledge of the Alps has commanded a respectful hearing for his opinion on any Alpine subject, has done me the honour to criticize at some length, in the *Geographical Journal* for April, an essay in which I lately published the substance of a lecture on Hannibal's march from the Rhone to the Po. The object of my lecture was to make known to English historical students the hypothesis regarding Hannibal's route which has been propounded by Commandant Colin,* whose contributions to modern military history have conferred so much distinction upon the General Staff of the French army. Commandant Colin's work was almost unknown in England, where the theory of which Mr. Freshfield is the most eminent supporter finds wide acceptance. I therefore thought it necessary to supplement my account of what I believe to be the most probable hypothesis by a concise account of Mr. Freshfield's arguments, and of the considerations which militate against the acceptance of his conclusion. Mr. Freshfield was more than entitled to reply by criticizing the case which I presented for the

* 'Annibal en Gaule.' Par J. Colin, Capitaine d'Artillerie breveté à la Section historique de l'Etat-Major de l'Armée. Paris: 1904.

route over the Col du Clapier, and by defending his own case for the Col de L'Argentière, or, as it is called, the Col de la Madeleine or Col de Larche. If my essay had had the good fortune to appear in the *Geographical Journal*, I might have been content to leave the readers of the *Journal* with both cases before them to judge between them. But my essay was an Oxford lecture, which the Clarendon Press generously undertook to print, and which for that purpose I recast and rewrote, while the Press bore the not inconsiderable expense of producing the necessary maps and figures. The subject, according to Mr. Freshfield, is "no earthly importance to any one, and of interest only to a very small portion of society." Yet he complains that the Press, in view of the very limited sale to be expected for a paper on such a subject, fixed the price at a figure much higher than would be appropriate for a pamphlet which might expect to be sold by the thousand. The readers of Mr. Freshfield's review being hardly likely to have seen my "not inexpensive" essay, I am unwilling to leave them without the means of estimating the character of his criticisms. Mr. Freshfield complains that the maps, for which I have to thank Mr. Darbishire, have only modern names and roads. But this is their merit. There were in 218 B.C. no roads over the Alps, but only mule tracks, which no one can trace with precise exactitude. Polybius intentionally gave no place-names, and almost all the ancient place-names are subjects of controversy. To put them on a map would be to prejudice the reader's judgment.

From the age of Augustus until our own time the route followed by Hannibal has been a matter of dispute. An endless literature is devoted to it.* Yet Mr. Freshfield complains that in forty-eight pages—an hour's lecture—I did not review all this literature, an omission which he attributes to ignorance. I regard the display of learning, especially when it is irrelevant, as a vice rather than a merit, and in this case I explained that my reason for treating the subject at all was that two new contributions had put the whole problem upon a new basis—the discovery that there is a pass which corresponds to the accounts of the chief ancient writers, and the new arguments showing that a passage of the Rhone just above the head of its delta also best accords with those records. That being the case, the discussions published before the date of these contributions lose most of their importance, and need not be specially considered. Mr. Freshfield was acquainted with the discovery of the Clapier, but rejects it, and I therefore was at much pains not only to examine with special care the pass which he favours, but to review the whole of his argument.

The problem appears to me to be one of the interpretation of the ancient sources of information, of which the most important is the history of Polybius, who before he wrote had been personally acquainted with men who took part in the campaign, and had himself, for the purpose of his history, travelled along Hannibal's route. Next in point of importance comes the history of Livy, who wrote a century and a quarter after Polybius, and whose account in regard to the beginning and end of the march tallies precisely with that of his great predecessor, while the third consists of seven lines quoted by a fifth-century writer from Varro, an elder contemporary of Livy. In my judgment the right method is to find a route which corresponds with the account of Polybius, to inquire whether that route accords also with Livy's account, and, where that is not the case, to find a reasonable explanation of the discrepancy, or apparent discrepancy, between the two. If the lines of Varro could be reconciled with

* A full account of the literature is given by M. Camille Jullian in the first volume of his 'Histoire de la Gaule.'

the route so traced, that would be an advantage. But we know that in Livy's time the route was a matter of dispute, and need not be surprised if Varro's view was not Livy's.

Mr. Freshfield, as far as I understand him, gives up Polybius, whom he therefore admits himself unable to explain. He rejects some of Livy's statements while accepting others, but he relies absolutely upon Varro. Yet on the last page of his review he appears to regard the problem as insoluble, as a subject "to amuse boys and perplex professors." If a solution is impossible, how can he have confidence in the one which he propounds, and why is he so anxious to depreciate the attempts of others to find one more satisfactory?

Mr. Freshfield's method of discussion fills me with amazement. He writes: "Professor Wilkinson has concentrated his attention on the views of an eminent historian, Dr. Arnold, and of a contemporary writer in these pages and the *Alpine Journal*, with a certain knowledge of the Alps. It must be a matter for regret that, before dealing with the former, Prof. Wilkinson did not make acquaintance with the edition of Dr. Arnold's chapters on the Second Punic War, brought out in 1886, by his grandson, the late W. T. Arnold. He would have found there, in an appendix of eleven pages, a valuable comment, written in the light of modern research, on the classical texts, together with one of the fullest and most judicial summaries of the whole controversy. He might also have learnt that Colonel Perrin's hypothesis is no novelty to English readers. It is true he would not have procured any support for that hypothesis. W. T. Arnold wrote, 'So far as I can discover, the only serious argument (for the Col de Clapier) is that it commands an exceptionally good view of Italy. This point, of the view of Italy, is not one of those on which it is advisable to lay stress'; and again Arnold's last words are, 'I should be disposed to say that Mr. Freshfield—for I do not regard Colonel Perrin with his Col du Clapier, as a serious rival—holds the field.'"

Here Mr. Freshfield insinuates that I was unacquainted with W. T. Arnold's work, and shelters himself behind W. T. Arnold's authority. He might easily have ascertained that when W. T. Arnold prepared his edition of his grandfather's work I was his colleague on the *Manchester Guardian*, living in close intimacy with him. Arnold was most anxious for my help in his study of Hannibal's march, for which I was able to supply him with some of his cartographical material, but not with the military opinion which he desired, for at that time I had no opportunity of visiting the passes, and, without seeing them, felt unable to form any opinion. Arnold often told me, as indeed his appendix tells his readers, that his judgment was determined by the authority of Mr. Freshfield. "The personal impressions," he writes in his appendix, "of a man with Mr. Freshfield's knowledge of the Alps have their weight." Accordingly, when Mr. Freshfield seeks to cover himself with W. T. Arnold's authority, he is hiding behind his own shadow. No one can better appreciate than I do Arnold's scholarship, industry, and judgment. His premature death was a great loss to ancient history. But it would have been monstrous of me to criticize his paper on Hannibal's route, written not, as Mr. Freshfield thinks, "in the light of modern research," but eighteen years before the appearance of Colin's masterly work. This is only one of Mr. Freshfield's numerous gratuitous insinuations that I have neglected to acquaint myself with the literature of my subject.

Mr. Freshfield asserts that I have not read his paper in the *Alpine Journal* for 1884 "with any close attention," and justifies this statement as follows: "My next complaint must be a more serious one. Prof. Wilkinson has, in a

matter of primary importance, committed himself to a statement that will be the more misleading to the uninformed reader since it comes from a professor of Military History. Prof. Wilkinson emphatically asserts that the pass of the Barricades in the Val di Stura cannot, in the absence of opposition from a foe, offer any difficulties whatever to the passage of an army. He has apparently forgotten the adventure of Francis I. on this very spot in August, 1515, before the battle of Marignano—adventures which are fully recorded in the passage from Paulus Jovius' 'Historia sui temporis,' which I quoted in a footnote to the article on which Prof. Wilkinson's criticism is based."

Not my attention or my memory was at fault, but Mr. Freshfield's judgment, which has been taken in by the picturesque language of the author whom he quotes. I will give the reader the means of judging for himself. Mr. Freshfield, in 1884, gave the following abstract from Paulus Jovius to prove that the Barricades are a terrible obstacle to the march of an army: "In August, 1515, Francis I. set out from Grenoble to pass the Alps, with an incredible number of carriages, powder-waggons, and 72 large cannons and 300 small pieces drawn by 5000 horses. . . . Their route led them across a ford of the Durance to Guillestre, where they camped, and over the Col de Vars into the upper valley of the Ubaye. On the descent they encountered the Rocher de St. Paul, having, by means of blasting, made it possible for cannon. They on the next day crossed the Col de l'Argentière and camped at Larche. In the gorge of the Barricades the greatest difficulties had to be overcome—guns were swung from rock to rock with ropes—but on the third day from Guillestre the whole force successfully traversed the defile and issued into the open valley of the Stura." Let us see exactly what this passage proves. The route taken by the army was from Guillestre over the Col de Vars to St. Paul, thence by Meyronnes to the Col de l'Argentière, and down through the Barricades to Pietra Porzio. The distance from Guillestre to Pietra Porzio by the modern high-road is 41 miles. The normal day's march of a modern army corps on a good road on a plain is with perfect arrangements 14 miles. The road followed by Francis I. in 1515 crosses the Col de Vars, 6939 feet high, the Col de l'Argentière, 6545 feet high, and passes the defile below St. Paul, one of the worst of the Alps, as well as that of the Barricades. According to Mr. Freshfield's historian, Francis I. made this march, in spite of the two high passes, of the defiles, and of the inferior roads, at about the normal rate of a modern army corps, covering in three days 41 or 42 miles. This proves to Mr. Freshfield that there was some terrible obstacle at the Barricades. To me it proves that no serious difficulty was encountered.

Paulus Jovius no doubt tells us that Francis I. had some trouble with his guns and waggons, which however, according to Mr. Freshfield's *précis*, were all got through the Barricades in a day. But Hannibal had no guns and no wheeled vehicles. I fail to see that I was guilty of negligence or forgetfulness in making no mention of the march of Francis I., when I expressed an opinion on the military character of the Barricades. But as Mr. Freshfield so emphatically recalls my attention to this matter, I may venture to point out certain puzzles in his *précis* of Paulus Jovius. On the route described from St. Paul to Pietra Porzio, the village of Larche comes 4½ miles before the Col de l'Argentière. How did the army, after crossing the Col, encamp at Larche? This difficulty in Mr. Freshfield's *précis* has led me to read again the Latin text which he quotes. If he will examine it again he will find that all the trouble with the guns and the swinging them from rock to rock by ropes took place between St. Paul and Larche, many miles from the Barricades, of which all that is said is that the road was there difficult and was mended and levelled by

the pioneers. The army went in one march from Larche to Pietra Porzio, a distance of 15 miles.

Mr. Freshfield quotes from Michelet what he thinks a highly coloured and exaggerated description of so easy a Col as that of l'Argentière: "Le vieux Trivulce se mit à courir les Alpes, et trouva cet affreux passage entre les glaces et les abîmes—sauvages gorges ou nul marchand, nul colporteur, nul contrabandier n'avait imprime ses pas."

But if Mr. Freshfield attached such great importance to the adventures of Francis I., he might, not without trouble, have found that Marshal Trivulce did not go near the Col de l'Argentière, but reconnoitred through the Queyras and there discovered a path by the Col de Valente which is 9156 feet high, between the shoulder of Monte Viso and the Col de l'Agnel. It was by the Col de Valente that the French advance guard crossed into Italy, and by the Col de L'Agnel that the seventy-two "large cannons" were transported.* The Col de L'Agnel is 9000 feet high, and Michelet's description by no means exaggerates the impression which these high passes would make upon the soldiers of the sixteenth century.

Mr. Freshfield refers to other campaigns, especially that of 1744, in regard to which he refers to the history by St. Simon of the operations of the Prince de Conti. Those operations have been recorded also by the Marquis de Pezay in his semi-official history of the campaigns of Maillebois and by General Bourcet in his treatise on mountain warfare. All these works are important for the understanding of Napoleon's plan for turning the Barricades in 1794. Conti's operations were planned by Bourcet, whose memoranda, written before the operations, and whose subsequent accounts of them are preserved and have been printed but not published. I happen to have closely studied these documents, and to have repeatedly examined the Barricades and their environment in connection with my lectures on the rise of Napoleon. But I have not gathered that St. Simon, Pezay, or Bourcet thought it hard to move troops through or past the Barricades in the absence of opposition. Mr. Freshfield urges that it was difficult to get guns back from Italy to France over the passes after the winter snowfall had begun. Of course that was always the case, but how does that fact illuminate the difficulties of Hannibal, or help us to decide which was the pass which he crossed?

Mr. Freshfield writes: "Prof. Wilkinson has, I assume, like other recent travellers, bowled down the excellent high-road which now traverses the gorges of Val di Stura." This is his comment on the statement made in my essay that I had made "an examination of all the principal passes, repeated over and over again for the Col de Larche." I have traversed the Barricades no less than six times, sometimes driving and sometimes walking, and always carefully scrutinizing all the military points, and have also walked over the mule path which is the alternative route. I have also been twice through the gorge of the Khyber, through which, before the modern road was made, British armies repeatedly marched in a river-bed between two walls of rock without their having been conscious of any remarkable exploit. In my judgment the Barricades are incomparably easier than the gorge of the Khyber.

So much for Mr. Freshfield's efforts, which appear to me to be irrelevant to the question at issue concerning Hannibal's route, to throw doubts upon my candour and my competence to form a judgment upon a matter of military history.

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* See "Les Bourcet et leur rôle dans les guerres Alpines," par A. de Rochas d'Aiglun, ancien Chef du Génie à Grenoble.

Next I come to Mr. Freshfield's defence of his own hypothesis. I gave this concise account of it: "Mr. Freshfield's case rests entirely on a passage quoted from Varro by a fifth-century grammarian as follows: 'Varro says that the Alps can be crossed by five routes: one by the sea through the Ligurians; a second by which Hannibal crossed; a third by which Pompeius set out to his war in Spain; a fourth by which Hasdrubal came from Gaul into Italy; a fifth which was formerly held by Greeks, so that the Alps through which it passes are called Greek (*i.e.* the Graian Alps).' Mr. Freshfield assumes that these passes correspond to the five modern high-road passes: the Corniche, the Col de Larche, the Mont Genèvre, the Mont Cenis and the Little St. Bernard. He assumes that Varro enumerates them in order from south to north, that Hasdrubal made use of the Mont Cenis and Pompeius of the Mont Genèvre, and that the first is the Roman road along the coast. He therefore infers that Varro believed Hannibal to have crossed by the Col de Larche." I still think this passage an exact statement of Mr. Freshfield's argument, but he objects to my using the word "assumes." I am ready to substitute any other word by which he prefers to express his conviction. If his interpretation were confirmed at all points, it would prove only that Varro believed Hannibal to have crossed the Col de Larche, but not that Livy or Polybius had that pass in mind. That the coast road corresponds to the modern Corniche is obvious. That Pompeius crossed the Mont Genèvre is probable. But the route of Hasdrubal is as much a matter of doubt as that of Hannibal himself, Livy and Appian say that both brothers followed the same route. Even Mr. Marindin, in the excellent paper to which Mr. Freshfield refers, does not accept Mr. Freshfield's interpretation of this passage. As for Mr. Freshfield's assumption that Varro enumerates the passes from south to north, an assumption which I neither affirm nor contradict, I fail to see the evidence that the second pass mentioned was the Col de l'Argentière. Why not the Col di Tenda, the Col Longet, the Col d'Agnel, or the Col de la Croix, all of which, in the days before high-roads and railways, were frequently traversed by armies?

I must crave the reader's indulgence for having had to dwell at too great length on matters in my opinion hardly relevant to the issue. I am compelled in self-defence to point out that Mr. Freshfield's daring on high peaks seems to have resulted in something like recklessness on the printed page. I am tempted to hazard the suggestion that an acquaintance with those parts of the Alps which can be traversed by infantry horses and elephants is not a private monopoly, and to remind Mr. Freshfield that my unhappy fate of being unable to accept his hypothesis about Hannibal's route is shared by some of the great Alpine climbers.

The real question is of method and of interpretation of evidence. There is no difficulty in finding routes by which Hannibal might have marched; the problem is to find the route which in fact he followed, and for that we must rely on such evidence as is supplied by our texts, beginning with those points on which they are in accord, and reserving those as to which they differ or are obscure.

The crossing of the Rhône is described by Polybius and Livy in terms that show no discrepancy between them. Commandant Colin has given reasons for holding that both accounts point to a crossing at the head of the delta of the Rhône, about Fourques. I have reproduced the substance of the argument, and added, "Captain Colin, by suggesting that the point of passage was at the head of the delta just above Fourques, has contributed almost as much to the elucidation of the story told by Polybius as Colonel Perrin by indicating

the Clapier as Hannibal's pass." Mr. Freshfield's ingenuous paraphrase or comment is that on this point "Prof. Wilkinson at once parts company with his predecessors." He adds, "no attempt is made to reconcile this hypothesis with the statement of Polybius that the confluence was 600 stadia from the point of passage." I am not aware that Polybius makes that statement. Polybius says (III. 39) that the distance from the crossing of the Rhone to the ascent of the Alps was 1400 stadia. He says (III. 50) that after settling the dispute in the island Hannibal made in ten days a march of 300 stadia along the river when he began his ascent towards the Alps. Many writers have assumed, as does Mr. Freshfield, that as 1400 minus 800 equals 600, the distance from the crossing to the island must have been 600 stadia. But this involves the assumption that "the ascent of the Alps" and "the ascent towards the Alps" began at the same place. My essay takes the "ascent towards the Alps" to begin at St. Nazaire, and the "ascent of the Alps" to begin near the Bec d'Echaillon, and therefore supposes that the 600 stadia inferred from the two passages of Polybius include both the distance from the crossing of the Rhone to the island and the distance from St. Nazaire to the Bec d'Echaillon.

Before the publication of Colin's volume, it was usual to assume that Hannibal crossed the Rhône at some point between Rocquemaure and Pont St. Esprit. From Fos, the most probable site of Scipio's camp by the sea, to a point on the Rhône opposite Rocquemaure is not less than 45 miles in a bee line; while from Fos to a point opposite Pont St. Esprit is rather more than 60 miles. These distances would be increased by at least 10 per cent. for any body of troops, however small, who would have to find their way along roads or tracks of which the course is always more or less serpentine. To assume a point of passage at this distance from the sea, is to reject the narrative of both Polybius and Livy, for both the historians represent as the work of one day the fight between Hannibal's cavalry and that of Scipio; the advance of the Roman victorious cavalry to within sight of Hannibal's camp on the river; their return to Scipio to report the result of their reconnaissance; Scipio's preparation to march, and the first stage of his march. This is all possible if Hannibal's camp was 20 or 30 miles distant from Scipio's camp by the sea. It is impossible if the two camps were 45 miles apart, and if, on the return journey, the cavalry had to ford a number of streams, one of which must have been the Durance. Again, if Hannibal crossed the Rhône between Arles and Tarascon, then the island, four days' march from the point of passage, cannot possibly have been north of the Isère. If I were to hazard a conjecture of my own, I should suggest that the Skaras which formed one side of the island might very well be the Durance itself, and the island may have included a long stretch of the Rhône valley; no northern limit to the island is mentioned, nor is there any reason for supposing that the ten days' march was not entirely within the island. Livy's description of the passage of the Druentia is a good description of the Durance between Cavaillon and its confluence with the Rhône; it bears no resemblance whatever to the Durance in the region between Mont Dauphin and its confluence with the Ubaye. My testimony as to the character of the Durance will, of course, not be acceptable to Mr. Freshfield, and therefore on this point I venture to refer him to the evidence of Lieut. Azan ('Annibal dans les Alpes,' par Paul Azan (Oran, 1902), p. 67) and of M. Camille Jullian, 1, 476 n.

Polybius and Livy concur in asserting that Hannibal reached the plain of the Po in the neighbourhood of the Taurini (Turin). They further concur in saying that from the summit of the great pass over the Alps the army had a remarkable view of the plains of the Po. What is the proper canon of

interpretation for these statements? Evidently to accept them, unless they are demonstrably false, absurd, or impossible. The second statement about the view from the pass used to be rejected by all writers because it was believed that no pass commanded such a view. But Colonel Perrin's discovery that from the summit of the Col du Clapier there is a view of Turin itself, of the range of hills behind Turin, and of a vast sweep of the plain of Italy, makes it necessary to admit that neither Polybius nor Livy was romancing. This pass, moreover, offers the shortest route from the valley of the Arc to Turin. Mr. Freshfield has never had more than a sneer for this route and for these passages of the ancient writers. Under his influence W. T. Arnold wrote that "this point of the view of Italy is one of those on which it is not advisable to lay stress." Why not? W. T. Arnold thought that the height of the Clapier (8125 feet) "suffices to dismiss it." I doubt whether W. T. Arnold knew that the extra height of the Clapier over the Mont Cenis is reached by the easiest and gentlest of slopes, so that there is no greater difficulty in the ascent of the one than of the other. But Mr. Freshfield knows that very well, for he refers to the account of the Clapier published in *Blackwood's Magazine* for May, 1836, in which Brockedon describes this extra ascent as "an easy path" following "a very gradual slope." Brockedon describes the view of "the plains and the Superga above Turin," though he saw it from the descent and not from the summit. He also gives the best account I have read of the descent from the Clapier, which is a most important part of the evidence as to Hannibal's route. Polybius and Livy both describe the descent as precipitous and dangerous, and both describe either two or three paths followed or attempted by Hannibal. Mr. Freshfield scornfully refers to my account of these paths, and to my suggestion that one of them, which I have had no opportunity of exploring, would repay investigation. Yet he is familiar with them all, and knows them all to be frequently used by the natives. The direct descent is thus described by Brockedon (*Blackwood*, May, 1836):

"After descending by a steep stony path, we came to a place above a pasturage, by a bright cold stream, where we were tempted to rest and indulge in some good things. . . . Hence we descended to a pasturage below, where a magnificent scene burst upon us. In the distance we saw the plains and the Superga above Turin, near, the mountains which on the right bound the torrent of the Doire Susanné, nearer still those of the valley of Exilles, and immediately below us, like a vast basin, the steep abrupt valley of the Clairée, in which the white clouds boiled and rolled as in a cauldron. We stood on the brink of enormous precipices, their outlines at our feet cut abruptly against the clouds, into which, through occasional openings made by the wind, we could see the black deep and shadowed valley. The scene was most impressive. Our guide was puzzled for a short time by the clouds, which obscured the point for which we should make; at length he led us down the precipice by a most extraordinary path, like winding steps, which were rudely cut in a crevice; it appeared like a descent through a chimney. Below this rift a steep, difficult, stony, and most fatiguing path brought us to some châlets . . . a still more difficult path led us to some other châlets, below which there were extensive pasturages on a steep slope. Having crossed these we entered a wood, down through which the most abrupt and fatiguing part of our route lay, which would scarcely have been practicable but for the entangled roots. From the wood we emerged upon a rocky slope, and after a march of eight or nine hours reached a few scattered stone huts at the head of the Val de Clairée. On looking back, we appeared to have descended the face of a precipice, down which

the numerous streams of the Clairée ran from the summit, as if they issued from the sky, to the torrent by which we rested. The white lines were traceable through 4000 or 5000 feet of their descent. The pass of the Clairée is, on the Italian side, the steepest I have ever traversed."

Ball, in the Alpine guide, describes both ways down from the Clapier. He says—

"From the Col a track, scarcely visible along the steep rocks, leads by the western side of the valley of the Clairée to the Col de Touilles, a depression in the ridge which divides the Clairée from the Dora, over which a path descends direct to Exilles. By that difficult, and even dangerous, way the Vaudois passed in the course of their surprising march under Henri Arnaud, and on the following day gained a signal victory at Salabertrand.

"The descent from the Col towards Susa commences through a narrow glen confined between the precipitous rocks of the Cime du Bard on the left, and steep rocky slopes on the right, overhung by a portion of the so-called *glacier pénible* forming the south-eastern declivity of the Mont d'Ambin. In half an hour the traveller reaches a little rocky basin, traversed by the stream, which lower down forms the Clairée. The view from this point is extremely interesting. From the verge of the precipitous rocks that fall away immediately below him the traveller sees the valley of the Clairée, more than 3000 feet beneath his feet; to the right is the rugged mountain of Touilles, traversed by the pass already referred to, and beyond it the ranges that enclose the valley of the Dora Riparia; while on the left, above some very steep rocks, are seen the remains of an ancient fort. It is not at first easy to guess how the descent is to be effected, but a practised cragsman will soon detect the ledges and gullies by which he may accomplish his object without any real difficulty. The first and steepest part of the way is by a sort of chimney in the face of rocks of calcareous schist, where the botanist will observe with interest *Brassica Richeri*, *Saponaria lutea*, and other rare species. On a little terrace half-way down the rocks is a hut, perched in a position where no domestic animal, save goats, can move without difficulty. After descending in this way for one and a half hours (two hours from the top), the track quits the rocks and crosses to the left bank of the affluent of the Clairée, close to a group of huts called Molarin. A short distance down the valley another group of hamlets is passed, on the opposite or right bank of the Clairée. The direct way to Susa here leaves the banks of the stream to follow a watercourse."

Ball also describes the Passo dell' Agnel, and says, "The Glacier de l'Agnel on the east side of the pass has a bad reputation, because an Italian engineer lost his life there. A track leads from below the glacier to the châlets of Touilles." This is, I believe, the track which Hannibal tried to reach by passing over a part of the Glacier de l'Agnel.

On none of the other passes that have been proposed does the nature of the descent permit of applying to them the descriptions given by Polybius and Livy of Hannibal's descent. But the Clapier corresponds to those accounts. It is a pass on the descent from which, after a snowfall Hannibal might have lost a great many men and have had extreme difficulty in getting his mules, horses, and elephants down to the valley. There are no such difficulties in the descent from the Mont Genèvre or from the Little St. Bernard, and none whatever in the descent from the Col de Larche.

Mr. Freshfield, in his zeal to undermine my credibility, unconsciously supports one of my contentions. I said that "the plain of the Po in the neighbourhood of Turin was reached in three days' march from the great pass

over the Alps." He objects to "the neighbourhood of Turin," and thinks that "the natural conclusion from the story is that the (last) Carthaginian camp was at the edge of the foothills in such a position as Avigliana." That is the very place which I named in my essay (p. 10) as the point in the neighbourhood of Turin which would be reached on the third day.

A reasonable interpretation of the evidence points with sufficient certainty to the Clapier as the end of the march, and to the Rhône near Fourques as its starting-point. It follows that the route was the line of the Rhône, the Isère, and the Arc. The difficulty is to trace this route in the details and incidents given by Polybius and Livy.

Polybius says that Hannibal from the crossing of the Rhône marched up its left bank, and on the fourth day reached a district called the Island, lying between the Rhône and one of its tributaries called Skaras. Here he settled a tribal dispute, obtained supplies for his army, and then marched in ten days 88 miles up the river, escorted by the friendly tribe. The friendly tribe left him, and after two more camps he had his first battle on entering the Alps.

A day's march is a description which implies as to distance very little more than a maximum. A modern army corps can cover 14 miles in a day. A larger body rarely covers as much. Hannibal's average from the Island to Avigliana was just under 9 miles a day. Of the four marches to the island the first began late in the day and may have been short. The last may also have been short, for it would end when the tributary bounding the Island had been crossed. Most of one day would be spent in getting 48,000 men across the Durance, which had to be forded. In these conditions I think 30 miles more than enough for the four days' march. This takes Hannibal across the Sorgues to Bédarrides, and the Sorgues may be the Skaras.

The next ten days' march would take him from Bédarrides to St. Nazaire, on the Isère, and the two following camps to the foot of the ascent towards Montaud, where the first battle may have begun.

The texts of Livy substitute for Skaras a name which may be Isara, the Isère, which at Valence is 98 miles, measured by the railway from Arles (just south of Fourques). To reach the Isère from Fourques in four days Hannibal must have marched 24 miles a day, about three times his usual rate, and, in my opinion, a rate quite impracticable for his force. But the MSS. of Livy read Arar, except one of the oldest and best (Florence, Laur. lxiii. 20), which reads Ibisarar.

How is Livy here to be reconciled with Polybius? I think the name of the river has been corrupted in the texts of Livy. Suppose we put the word Skaras into Livy's text, and assume his Island to be some place just north of the Sorgues. After recounting the dispute in the Island, Livy says: "Having composed the feuds of the Allobroges, Hannibal marched towards the Alps, not however pursuing a direct course, but turning leftwards to the country of the Tricastini." The Tricastini are placed by some antiquaries near St. Paul Trois Chateaux, in the Rhône valley, by others on the western slope of the Alps, *i.e.* on the side of the Rhône valley, with their capital at Aouste, *i.e.* Augusta Tricastinorum, on the Drome. If the island was at Bédarrides, Hannibal, looking towards the Alps, would have the Tricastini on his left, so that Livy would accord with Polybius as to his route. But if the Island were north of Valence, Hannibal, looking at the Alps, would have the Tricastini on his right, so that in that case Livy must bring him back again down the Rhône valley, though how he can say "left" for "right" is unintelligible to me. Mr. Freshfield takes the Island to be north of the Isère, but lets Hannibal march only as far as

Valence, just south of the Isère. Then he makes Hannibal go to his left towards Grenoble. But how does he make him approach the Tricastini, whom he must have already passed on the way to Valence?

Commandant Colin quotes the best French geographers, Messrs. Vidal de Lablache and Ardouin-Dumazet, to show that Polybius's description of the Island as "corn-bearing and populous" could not apply to the area between Rhône and Isère, but would apply to the district of the Sorgues. Mr. Freshfield simply contradicts this. He says, "the country between the Rhône and the Isère is still populous and corn-bearing." On this subject I prefer the judgment of the French geographers to that of the best Alpine climber. Mr. Freshfield further contradicts the French. He denies that the town of Isle sur Sorgues "is the centre of an extensive district of the exceptionally fertile character Prof. Wilkinson would have us believe the Island was." Here is the statement of M. Lenthéric: "La plaine qui cotoie la Rhône, et qui s'étend jusqu'a la montagne de Vaucluse, est en effect un véritable jardin. Enfermée entre le grand fleuve, la Durance, et la petite rivière de l'Ouveze, traversée par la Sorgues et ses ramifications, sillonnée par un nombre considerable de canaux et de filioles, cette plaine privilegiée, tour à tour échauffée par le soleil de Provence rafraichie, colmatée, nourrie par les eaux d'arrosage, est devenue une sorte de terre promise."

Mr. Freshfield's treatment of the problem of Hannibal's march recalls the warning of Bourcet, the great eighteenth-century master of military geography of the Alps: "Rien n'est plus dangereux que les personnes qui hasardent le discours sur la connaissance d'un pays; on ne saurait avoir trop d'attention à n'y pas donner aveuglément sa confiance, ni pendre trop de precautions pour s'assurer de la verité du détail dont on peut avoir besoin." Speaking of an officer whose duty requires him to consider large questions of war, Bourcet says, "Ce n'est pas assez pour lui de connaître le pays comme un bon guide, il faut qu'il le connaisse militairement."

The progress of knowledge is from hypothesis to hypothesis. A difficult problem is seldom solved without a long and patient effort, and the man who proposes a new solution expects it to be riddled with criticism, by which alone its weakness can be exposed or its strength tested. The man who attempts a solution and the man who criticizes it are both serving the cause of the advancement of learning. To have to deal with a modest and courteous adversary makes discussion a pleasure, but even without that charm it may still be useful. In this matter of Hannibal's march I am no discoverer. My purpose from the beginning has been to make known the results of other men's researches. If I can succeed in that, even though I have incurred Mr. Freshfield's displeasure, I shall have my reward.

SPENSER WILKINSON.

It would not be fair to our Fellows were I to trespass on the *Journal* with any detailed comment on Prof. Wilkinson's rejoinder to my objections to the statements put forward in his recent treatise on Hannibal's march. I shall therefore confine myself here to such notes as seem imperatively called for, and shall curtail quotations I might otherwise make at much greater length.

1. To most of my readers, I trust, the number of pages I have devoted to the discussion of Hannibal's Pass has been sufficient proof that I did not intend seriously to endorse the quaintly expressed opinion I quoted, that the subject is "of no earthly importance to any one."

2. Prof. Wilkinson's reason for putting no classical names on his maps does not seem to me any argument for inserting modern roads and railroads.

3. The following passage conveys a most inaccurate impression of what I wrote: "An endless literature is devoted to it (Hannibal's Pass). Yet Mr. Freshfield complains that in forty-eight pages—an hour's lecture—I did not review all this literature, an omission which he attributes to ignorance." What I said was, "He does not deal, nor can any writer be expected to deal, with (his predecessors) in detail." I refer to the whole passage on page 404 of my article. I made no such general imputation as that attributed to me.

4. I do not "give up" Polybius. On the contrary, I have set out at some length my view and explanation of his narrative in a passage too long to quote here (*Alpine Journal*, vol. **11**, p. 269).

5. As to the march of Francis I., I have not all the authorities at hand. Sismondi and Brockedon make the Passage of the Barricades take place on the fourth day from Embrun. Paulus Jovius is by no means clear; but I think that to a certain extent I may have misread him in 1884. It seems to me possible that he meant his readers to understand that Francis, starting from Guillestre, reached on the first day the Rocher de St. Paul; on the second Larche, or Bersesio; on the third Pietraporzio, a march in all of not more than 35 miles by the old mule roads. The difficulty as to Larche in my *précis* is derived from the original narrative; but I ought to have noted it. Paulus Jovius first says the army crossed into the "Argentière" valley, and then adds, "next day from the villages of Larche and Bersesio it descended into Val di Stura." The explanation may be, either that Argentière is a slip for Barcelonnette, or that the advance guard camped at Bersesio, leaving the bulk of the army at Larche. This is mere conjecture; but in the latter case the troops at Bersesio would have had only 5 miles to march to Pietraporzio. I take Jovius's "three days" as referring to the march from Guillestre to Pietraporzio. The army could not possibly have covered in them the distance from Embrun to Demonte, as the text would seem to imply.

What Paulus Jovius says of the Barricades is that the *iniquissimum iter* had to be repaired *pari munitorum artificio*. Surely we may infer from the "pari" that the phrases he employs as to the engineers' exploits in the earlier stages of the march apply to the Barricades also. I mentioned the snow found in November on the Col de l'Argentière as one proof among many that snow may be found there after the autumnal equinox, a fact that has been called in question by some writers (*Alpine Journal*, vol. **11**, p. 279).

6. Surely it is not open to dispute that Michelet is pre-eminently a picturesque writer? But if Prof. Wilkinson wished to reprove me for calling his picture of the passes of the Western Alps highly coloured, he should have quoted it in full, and not have left out the best part: "La virginité de leurs neiges n'était effleurée, depuis la création, que par l'enfant de la montagne, le craintif et rusé chamois, et parfois aussi, peutêtre, par l'intrépide folie du chasseur, qui la passion entraîne après lui aux corniches étroites des gouffres."

7. Polybius says (ch. 43) that Hannibal's camp at the Passage and Scipio's by the sea were about four days' march apart. Prof. Wilkinson, who professes to follow Polybius, believes they were only "20 to 30 miles" apart. His whole argument on this point seems to me very unsatisfactory. As to his attempt to distinguish between Polybius's two references to the Ascent of the Alps (chs. 39 and 50) see my remarks, *Alpine Journal*, vol. **11**, p. 271.

8. As to the position of the Tricastini, see *Alpine Journal*, vol. **11**, p. 272. In quoting the sentence in which I mention Avigliana, Prof. Wilkinson has obscured its purport by omitting the words "Borgo San Dalmazzo, or" which precede Avigliana.

9. I read with some surprise that in Prof. Wilkinson's eyes the valley of the Durance between Mont Dauphin and the confluence of the Ubaye "bears no resemblance whatever" to Livy's descriptions. This has not been the impression made on several earlier writers, whose views, however, may have been unconsciously coloured by their theories. But I note that unbiassed authorities, such as Joanne and Ardouin Dumazet, in describing the valley below Embrun, speak of "le large lit de la Durance," and of "la Durance couvrant une enorme étendue de ses déjections," and go on to emphasize the peculiarly forbidding character of the landscape.

Murray's description ('Handbook to France,' 1881, part 2, p. 228) may also be compared, "The valley hereabouts is a scene of desolation; the turbulent river rolls along a furious flood of muddy water, undermining the loose shaly rocks composing its sides, strewing the bottom with rubbish, and constantly forcing its banks."

10. Prof. Wilkinson is, of course, at liberty to disregard any statement made of my own knowledge as to the richness of the district between the Rhône and the Isère. The following extract from the first edition of Murray's 'Handbook to Switzerland and Savoy,' 1838, p. 322, may, however, serve as proof that I did not write rashly. I regret that I must abbreviate. "Yenne existed in the time of the Romans . . . it lies on the ancient route from France to Italy by the Mont du Chat. The whole neighbourhood is very rich in cultivation; corn, wine, and fruit trees abound. . . . The extreme richness of the country cannot fail to draw the attention of the traveller . . . its excessive fertility is its striking feature. . . . The scene, on looking back towards France, is one of the most fertile in the world, studded with villages and towns." In the 'Voyages' of the author to whom Prof. Wilkinson appeals, Mons. Ardouin Dumazet, I find confirmation of these statements as to the Island.

11. I am not familiar with the country north of Avignon, and I feared for a moment, on reading the quotation from Lenthéric, and finding it more or less confirmed by Arthur Young, that "Murray" might have misled me. But a further reference to a scientific observer above all suspicion, describing the exact spots in question, more than justifies the Guidebook. I quote from the "Voyages" of H. B. de Saussure (ch. xxx.) "d'Avignon à l'Isle.—En faisant cette route on traverse à l'est d'Avignon une plaine en pente presque insensible dont la partie la plus basse et la plus voisine du Rhône est belle et fertile mais que en s'éloignant devient stérile et pierreuse . . . La route (de Châteauneuf) jusqu'à l'Isle qui est de deux lieues passe sur des sables argilleux qui le rendent très fatiguante. Les environs de la petite ville de l'Isle, reéllement située dans une isle que forme la Sorgne et environnée des bras bordés d'arbres de cette jolie rivière ont été justement célébrés." See also ch. xxxi. as to the country towards Montélimar. "Les 18 lieus de route entre Avignon et Montélimar ne présentent rien de bien intéressant pour le minéralogiste. En général le terrein est couvert jusqu'à une grande profundeur de cailloux roulés qui le rendent tristement stérile et monotone, etc." In this district, as de Saussure proceeds to describe, fertility follows irrigation, and, as in the East, the contrasts are violent. It is, of course, probable that irrigation has been greatly extended since Hannibal's days.

I could add much were there room: I may do so at another opportunity. I must conclude here by assuring Prof. Wilkinson that I am very sorry if anything in the form in which I have put my comments on his essay has lessened for him the pleasure I have myself felt in returning, after a quarter of a century, to this—to those who take part in it—fascinating and endless controversy. If

he has felt aggrieved at any of my criticisms, I would ask him to remember that they were a reply to a treatise in which he "unconditionally" discarded the views of all his predecessors among his own countrymen, and told them—somewhat harshly—that from want of diligence or opportunity they had failed to appreciate and interpret Polybius and Livy. But I fear I must continue my efforts to "undermine the credibility" of a theory according to which Hannibal's guides, who knew the mountains, must—at the end of October—have deliberately led him over one of the loftier, and—on the Italian side—steepest, and least practicable of the by-passes of the Western Alps. I cannot agree with Prof. Wilkinson in regarding the interesting arguments of the French officers, Colonel Perrin and Commandant Azan, as of the nature of a discovery, while Captain Colin's view as to the Passage appears to me to be irreconcileable with the authorities. Prof. Wilkinson's long quotations from Brockedon and Ball as to the character of the tracks round the Col de Clapier seem to me not to prove, but to destroy, his case. Finally, I must protest once more that I have never claimed to have myself solved the puzzle. I wrote in 1884, and I have repeated more than once since, "with the aid of all the authorities put together it is impossible to satisfy oneself as to the Pass of Hannibal." It is not an absolute confidence in my own suggestion that leads me to assail alternative conjectures which seem to me far less admissible.

DOUGLAS W. FRESHFIELD.

The River Heath.

On page 378 of the *Geographical Journal*, April, 1911, Major P. H. Fawcett, says, "In lat. 12° 30″ S., long. 68° 44″ W., the river Heath (so named from an English explorer killed here by the savages)."

In a pamphlet, 'Bolivia-Peru, Documentos que justifican la actitud de Bolivia contra el laudo dictado por el Presidente de la Republica Argentina en la cuestion de limites con el Republica del Peru, 1909, New York,' page 63, footnote to "river Heath," it is stated, "Este nombre se dio en honor del cindano Americano Edwin R. Heath, que exploro la region por cuenta de Bolivia en 1880 y que hoy desempaña las funciones del Consul de ese pais en Kansas City, U.S.A."

In exploring the river Beni, I found the Madre de Dios river emptied into the Beni, and not into the Purus as indicated in all maps. After my exploration, Colonel Pando was authorized to explore the Madre de Dios river. Finding a stream coming from the south, which he ascended and mapped, he named it river Heath in my honour. He wrote me and sent me a copy of the map he made. I am sorry Major Fawcett had the impression he stated in his article.

EDWIN R. HEATH.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1910-1911.

Twelfth Meeting, May 8, 1911. Major LEONARD DARWIN, President, in the Chair.

ELECTIONS.—*Dr. Ralph Arnold; Alexander Burnes Bagnold; Vernon Foster Crouch; F. Dow Covington; H. E. Fass; Walter H. Friedeberg; Herbert John Sidney Jones; Herbert James W. Marshall; Charles L. Schultz; Henry Lee*

Hadwen Shuttleworth, M.A.; Donald Herbert Edmund Sunder; Eric Montagu Tabor.

The paper read was—

"The Foundation and Development of British Guiana, from Unpublished Documents." By J. A. J. de Villiers.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Bosnia and Herzegovina. Adamović.
Vegetationsbilder (Karsten und Schenck) **8** (1910) : Plates 19–24.
Vegetationsbilder aus Bosnien und der Herzegowina. Von L. Adamović. *Illustrations.*

Austria—Alps—Valleys. *Deutsche Rundschau G.* **33** (1911) : 159–163. Stummer.
Talstudien im Gebiete des Ankogel und der Hochalmspitze. Von Prof. Dr. E. Stummer. *Map and Illustration.*

Austria—Coast. *Geol. Charakterbilder (Stille)* 5 Heft (1911) : 6 Plates. Götzinger.
Morphologische Bilder von der nördlichen Adria und von Istrien. Von G. Götzinger. *Illustrations.*

Austria—Tirol—Glacier. *Z. Gletscherkunde* **5** (1910) : 81–86. Lagally.
Der Alpeiner Ferner im Stubai 1909. Von Dr. Max Lagally. *Map and Illustration.*

Baltic—Plankton. Merkle.
Das Plankton der deutschen Ostseefahrt, Juli—August 1907. Von Dr. H. Merkle. (Arbeiten der Deutschen wissenschaftlichen Kommission für die Internationale Meeresforschung : B., Aus den Laboratorium für Internationale Meeresforschung in Kiel ; Biologische Abteilung No. 14.) Kiel, 1910. Size 12½ × 10½, pp. 323–346. *Sketch-map, Diagrams, and Sections.*

Denmark—Hydrography. **K. Søkort-Arkiv.**

Fortegnelse over fyr og taagesignal-stationer i Kongeriget Danmark med bilande. 1911. Udgivet af det Kongelige Søkort-Arkiv. Copenhagen, 1911. Size 10 × 6½, pp. 154.

France—Alps. *Ann. de G.* **19** (1911): 412–439. **Blanchard.**

Sixième excursion géographique interuniversitaire (Alpes occidentales). Par Raoul Blanchard. *Illustrations.*

France—Alps. *B.G. Hist. et Descriptive* 1910 (1911): 108–134. **Buffault.**

Les forêts et pâturages du Mandement de Guillestre. Par Pierre Buffault.

An historical study.

France—Alps. *Mém. S. Phys. Genève* **36** (1910): 411–586. **Collet.**

Les Hautes Alpes Calcaires entre Arve et Rhône. Par Léon W. Collet. *Map, Sections, and Illustrations.*

France—Alps—Glacier. *Z. Gletscherkunde* **5** (1910): 143–148. **Rabot.**

Le glacier de Lépenaz de 1818 à 1847 (Savoie méridionale). Par Charles Rabot. *Map. Also separate copy, presented by the Author.*

See note in the May number, p. 562.

France—Haute Savoie. **Chaix.**

Contribution à l'Étude Géophysique de la Région de Genève: la Capture de Theiry. Par M. Émile Chaix. (Extrait des *Archives des Sciences Physiques et Naturelles*, Tome **xxx.**, September 1910.) Genève, [1910]. Size 9 × 5½, pp. 4. *Sketch-map and Plans.*

On a singular case of river capture in the Rhone basin below the Lake of Geneva.

France—Lorraine. *Ann. de G.* **19** (1911): 440–455. **Gravier.**

La plaine Lorraine. Par Gaston Gravier.

See note in the Monthly Record.

Germany—West Prussia. **Seefried-Gulgowski.**

Von einem unbekannten Volke in Deutschland. Ein Beitrag zur Volks- und Landeskunde der Kaschubei. Von Ernst Seefried-Gulgowski. Berlin: Deutsche Landbuchhandlung G. m. b. H., 1911. Size 9½ × 6½, pp. 228. *Illustrations. Price* 5*s.*

Italy—Language. **Caini.**

Captain A. Caini. English and Italian technical military terms. Rome: G. de Agostini & Co., 1907. Size 7½ × 5, pp. 134. *Presented by the Publishers.*

Italy—Milan—Historical. **Archivio Storico, Milan.**

Comune de Milano; Archivio Storico. Catalogo ragionato della raccolta cartografica e saggio storico sulla cartografia milanese. Del Dott. Ettore Verga. Milan, 1911. Size 10 × 7, pp. xii. and 192. *Facsimile Maps and Plans. Presented by the Civic Museum, Milan.*

Italy—Rome. **Agostini.**

Guida di Roma e dintori . . . Roma: Istituto Geografico de Agostini, [*not dated*]. Size 7½ × 5, pp. xxxii. and 96. *Map and Plan. Price* 1 *Lire* 50.

Mediterranean—Islands. **Flitch.**

Mediterranean moods: footnotes of travel in the islands of Mallorca, Minorca, Ibiza, and Sardinia. By J. E. Crawford Flitch. London: Grant Richards, 1911. Size 9 × 6, pp. 324. *Maps and Illustrations. Price* 12*s.* 6*d. net.*

Russia—Finland. **Chalhoub.**

Maurice Chalhoub. La Finlande; géographie, histoire, politique, législation, finances, agriculture, commerce, industrie, sciences et arts. Paris: H. le Soudier, 1910. Size 10 × 6½, pp. 582. *Maps and Illustrations. Price* 25 *fr.*

Spain. **Calvert.**

Valencia and Murcia: a glance at African Spain. By A. F. Calvert. London: J. Lane, 1911. Size 7½ × 5, pp. xvi. and 46. *Illustrations. Price* 3*s.* 6*d. net. Presented by the Publisher.*

Spain—Balearic Isles. **Behen.**

Marie de Behen. Mallorca (Baleares). Geneva, etc.: Georg et Cie., [1910]. Size 11 × 8½, pp. 72. *Illustrations. Price* 10*s.*

Spain—Balearic Isles. **Boyd.**

The fortunate isles: life and travel in Majorca, Minorca, and Iviza. By Mary Stuart Boyd. London: Methuen & Co., (1911). Size 9 × 5½, pp. xii. and 340. *Illustrations. Price* 12*s.* 6*d. net.*

Switzerland—Place-names. *B.S. Neuchâtel. G.* **20** (1909–1910): 232–249. **Muret.**

De l'orthographe des noms de lieu de la Suisse romande. Par Ernest Muret.

Turkey—Macedonia. *G.Z.* **16** (1910): 560–572. **Oestreich.**

Die Oberfläche Mazedoniens. Von Karl Oestreich. *Map and Diagram.*

United Kingdom—Berkshire. **Stenton.**

The place-names of Berkshire: an essay. By F. M. Stenton. (University College, Reading: Studies in Local History.) Reading: University College, 1911. Size 9 × 6, pp. viii. and 56. *Map. Price* 2*s.* 6*d. net. Presented by the College.*

United Kingdom—Geology. **Reid and others.**

Memoirs of the Geological Survey. England and Wales. Explanation of Sheets 335 and 336. The Geology of the country around Padstow and Camelford. By Clement Reid, G. Barrow, and Henry Dewey; with contributions by J. S. Flett and D. A. MacAlister. London: Darling & Son, 1910. Size 9½ × 6, pp. 120. *Sketch-maps, Sections, and Illustrations. Price* 2*s.* 3*d.*

United Kingdom—Historical. **Berry.**

Lands and their stories; Book IV. Scotland, Ireland, and Britain over Seas. By A. J. Berry. London, etc.: Blackie & Son, 1911. Size 8 × 5½, pp. iv. and 240. *Sketch-map and Illustrations. Price* 1*s.* 6*d. Presented by the Publishers.*

United Kingdom—Hull. **Sheppard.**

The evolution of Kingston-upon-Hull, as shown by its plans. By Thomas Sheppard. Hull: A. Brown & Sons (for the Hull Corporation), 1911. Size 9 × 5½, pp. 202. *Plans and Illustrations. Price* 3*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—Ingleborough. **Strahan.**

Memoirs of the Geological Survey. England and Wales. Guide to the Geological model of Ingleborough and district. By Aubrey Strahan. London: E. Stanford, etc., 1910. Size 9½ × 6, pp. 17. *Map and Illustration. Price* 4*d.*

United Kingdom—Ireland. **Howarth.**

The Oxford Geographies. Edited by A. J. Herbertson. A geography of Ireland. By O. J. R. Howarth. Oxford: Clarendon Press, 1911. Size 7½ × 5, pp. 224. *Sketch-map and Illustrations. Price* 2*s.* 6*d. Presented by the Publishers.*

United Kingdom—Ireland—Cavan. **Kilroe and others.**

Department of Agriculture and Technical Instruction for Ireland. Memoirs of the Geological Survey of Ireland. The Geological Features and Soils of the Agricultural Station of the Department of Agriculture at Ballyhaise, in the County of Cavan. By J. R. Kilroe, H. J. Seymour, and T. Hallissy. Dublin, 1910. Size 9½ × 6, pp. iv., and 50. *Map, Diagrams, and Illustrations.*

United Kingdom—London—Historical. *J.R.S. Arts* **59** (1910): 114–126. **Smith.**

A New View of Roman London. By Reginald A. Smith. *Sketch-maps.*

United Kingdom—Nottingham. **Lamplugh and Gibson.**

Memoirs of the Geological Survey. England and Wales. The Geology of the country around Nottingham. By G. W. Lamplugh and Dr. W. Gibson. London: Darling & Son, 1910. Size 9½ × 6, pp. vi. and 72. *Sketch-map, Diagrams, Sections, and Illustrations.*

United Kingdom—Rainfall. **Nash.**

Quart. J.R. Meteorol. S. **36** (1910): 309–322; *Discussion*, 322–328.

Daily Rainfall at the Royal Observatory, Greenwich, 1841–1903. By William Carpenter Nash.

United Kingdom—Scotland. **Clough and others.**

Memoirs of the Geological Survey. Scotland. The Geology of East Lothian, including parts of the counties of Edinburgh and Berwick. (Explanation of sheet 33, with parts of 34 and 41.) 2nd edit. Revised and re-written by C. T. Clough, G. Barrow, C. B. Crampton, H. B. Maufe, E. B. Bailey, and E. M. Anderson. With contributions on the Silurian Tableland by Dr. B. N. Peach and Dr. John Horne. Edinburgh: Morrison & Gibb, 1910. Size 9½ × 6, pp. x. and 226. *Maps, Sections, and Illustrations. Price* 4*s.* 6*d.*

United Kingdom—Scotland. **Peach and others.**

Memoirs of the Geological Survey. Scotland. The Geology of Glenelg, Lochalsh, and South-east part of Skye. (Explanation of one-inch map 71.) By Dr. B. N. Peach, Dr. John Horne, H. B. Woodward, C. T. Clough, Alfred Harker, and C. B. Wedd. Edinburgh: Morrison & Gibb, 1910. Size 9½ × 6, pp. x. and 206. *Sketch-maps, Sections, and Illustrations. Price* 3*s.* 6*d.*

United Kingdom—Scotland—Edinburgh. **Peach and others.**

Memoirs of the Geological Survey. Scotland. The geology of the neighbourhood of Edinburgh. (Sheet 32, with part of 31.) Second edition. By Dr. B. N. Peach, C. L. Clough, L. W. Hinxman, the late J. S. Grant Wilson, C. B. Crampton, H. B. Maufe, E. B. Bailey, and others. Edinburgh, 1910. Size 10 × 6, pp. xii. and 446. *Maps, Sections, and Illustrations. Price* 7*s.* 6*d. Presented by the Survey.*

United Kingdom—Wales—Communications. **Howells.**

Transport facilities in the mining and industrial districts of South Wales and Monmouthshire: their history and future development. By Clarence S. Howells. (Publications of the Department of Economics and Political Science in the University College of South Wales and Monmouthshire . . . No. 2.) London: P. S. King & Son, 1911. Size 9½ × 7, pp. iv. and 56. *Diagrams. Price* 2*s. net. Presented by the Publishers.*

United Kingdom—Weald. *Quart. J. Geol. S.* **14** (1910): 640-692. **Bury.**

The Denudation of the western end of the Weald. By Henry Bury. *Sketch-maps and Sections.*

ASIA.

Afghanistan—Railway. *Deutsche Rundschau G.* **33** (1911): 118-123. **Zugmayer.**

Das afghanische Bahnprojekt. Von Dr. Erich Zugmayer. *Map.*

Asia. **Ronaldshay.**

An Eastern Miscellany. By the Earl of Ronaldshay. Edinburgh, etc.: W. Blackwood & Sons, 1911. Size 9 × 6, pp. xiv. and 422. *Price* 10*s.* 6*d. net. Presented by the Publishers.*

Central Asia. *Petermanns M.* **57** (1911): [i.]: 75-76. **Strindberg and Hedin.**

Renat's Karte über den Lop-nor. Von August Strindberg und Sven v. Hedin. *Facsimile map.*

Reason is shown for believing that the Swedish traveller Renat visited Lop-nor in the eighteenth century (see April number, p. 436).

Central Asia—Physical History. *La G., B.S.G. Paris* **23** (1911): 39-58. **Martonne.**

L'évolution du relief de l'Asie centrale. D'après des publications récentes.

A discussion of the recent work of Davis, Willis, Stein, and others.

Ceylon—Historical. **Knox.**

An Historical Relation of Ceylon, together with somewhat concerning Severall Remarkeable passages of my life that hath hapned since my Deliverance out of my Captivity. By Robert Knox, a Captive there near Twenty Years. Glasgow: J. MacLehose & Sons, 1911. Size 9 × 6, pp. lxviii. and 460. *Facsimile Map and Illustrations. Price* 12*s.* 6*d. net. Presented by the Publishers.*

Ceylon—Veddas. **Seligmann.**

The Veddas. By Dr. C. G. Seligmann and Brenda Z. Seligmann. Cambridge: University Press, 1911. Size 8½ × 5½, pp. xx. and 464. *Map and Illustrations. Price* 15*s. net. Presented by the Publishers.*

Chinese Empire. **Ollone.**

Mission d'Ollone, 1906-1909. Les derniers barbares; Chine, Tibet, Mongolie. Par le Commdt. [Vicomte H.] d'Ollone. Paris: P. Lafitte et Cie., 1911. Size 11 × 7½, pp. vi. and 374. *Maps and Illustrations. Price* 15 *fr. Two copies, presented by the Vicomte d'Ollone and the Publishers.*

Chinese Empire—Tibet. *B. Comité l'Asie Française* **10** (1910): 507-513. **Landor.**

Les sources principales du Brahmapoutre et du Sutledje. Par A.-Henry Savage Landor. *Map.*

The author, who claims to have located the above sources previous to Dr. Hedin's visit, shows his route on the map.

India—Punjab. *Records Geol. Surv. India* **40** (1910): 36-51. **La Touche.**

Lakes of the Salt Range in the Punjab. By T. D. La Touche. *Sketch-map Sections, and Illustrations.*

India—Punjab. **Hutchinson.**

Guide to Dalhousie, the Chamba State, and the neighbouring hills; containing a description of the station, routes to Dalhousie and into the interior, extracts from municipal bye-laws, etc. Compiled by Captain J. B. Hutchinson. 3rd edit. Lahore, 1910. Size 8½ × 5½, pp. 82 and ii. *Map. Presented by Miss M. E. V. Cust.*

India—Bengal—History. *J. and P. Asiatic S. Bengal* **5** (1909); 199–235. **Chakravarti.**

Notes on Gaur and other old Places in Bengal. By Monmohan Chakravarti. *Sketch-map.*

India—Bengal—Rivers. *J. and P. Asiatic S. Bengal* **5** (1909): 393–405. **Inglis.**

Some of the Problems set us by the Rivers of Bengal. By W. A. Inglis.

India—Crops and rainfall. *Mem. Asiatic S. Bengal* **2** (1910): 347–429. **Jacob.**

On the Correlations of Areas of Matured Crop and the Rainfall, and certain allied Problems in Agriculture and Meteorology. (A preliminary inquiry.) By S. M. Jacob. *Map and Diagrams.*

India—Himalaya. *Alpine J.* **25** (1910): 331–347. **Filippi.**

H.R.H. the Duke of the Abruzzi's Expedition to the Karakoram. By Dr. F. De Filippi. *Illustrations.*

India—Population. *Indian Antiquary* **40** (1911): 7–37. **Bhandarkar.**

Foreign elements in the Hindu population. By D. R. Bhandarkar.

India—Sikkim—Glaciers. *Records Geol. Surv. India* **40** (1910): 52–62. **La Touche.**

A Preliminary Survey of certain glaciers in the Himalaya (continued from *Records*, vol. 35, part 4). D.—Notes on Certain Glaciers in Sikkim. By T. H. D. La Touche. *Plan and Illustrations.*

Malay Archipelago—Celebes. **Abendanon.**

Ts. K. Nederl. Aardr. Genoot's. II. Ser. **26** (1909): 141–142, 464, 645–654, 800–821, 988–995; **27** (1910): 79–106, 506–529, 979–1001, 1219–1232; **28** (1911): 73–90.

Onderzoek van Centraal-Celebes. Door E. C. Abendanon. *Maps, Panoramas, and Illustrations.*

Reports during extensive explorations in Celebes.

Malay Archipelago—Celebes. **Abendanon.**

Ts. K. Nederl. Aardr. Genoots. II. Ser. **28** (1911): 103–109.

De oude beddingen der beneden-Sadangrivier en de baai van Pare Pare. Door E. C. Abendanon. *Map.*

Siam—Phytogeography. **Hosseus.**

Beiträge zur Flora Siams. Von Dr. Carl Curt Hosseus. (Sonderabdruck aus "Beihefte zum Botanischen Centralblatt," Bd. 27; Dresden, 1910.) Size 9 × 6, pp. 455–507. *Presented by the Author.*

South-Eastern Asia. *Le Tour du Monde* **16** (1910): 385–456. **Lajonquière.**

De Saïgon à Singapour, par Angkor, autour du Golfe de Siam. Par le Commandant E. Lunet de Lajonquière. *Sketch-map and Illustrations.*

Tian-Shan. *M.G. Ges. München* **5** (1910): 347–359. **Merzbacher.**

Meine letzte Tian-Shan-Expedition, 1907–08. Von Prof. Dr. G. Merzbacher. *Illustrations.*

Tian-Shan. **Therese of Bavaria.**

Des Prinzen Arnulf von Bayern Jagdexpedition in der Tian-Schan. Nach Tagebuch und Briefen zusammengestellt von Therese Prinzessin von Bayern. Munich, etc.: R. Oldenbourg, 1910. Size 10½ × 7½, pp. xvi. and 306. *Maps and Illustrations. Price* 10*s.*

Prince Arnulf undertook a hunting expedition to the Tian-Shan in 1907, in company with Dr. Merzbacher, but succumbed to inflammation of the lungs soon after his return to Europe. The present work has been edited from his journals by his sister, herself known as a keen traveller.

Turkey—Asia Minor. *National G. Mag.* **21** (1910): 831–846. **Huntington.**

The Lost Wealth of the Kings of Midas. By Ellsworth Huntington. *Illustrations.*

Sketches of present-day life in Asia Minor, with a discussion of the cause of its poverty.

Turkey—Asia Minor. *B.R.S.G. Madrid* **52** (1910): 273–327. **Weissberger.**
Noticia de una exploración geográfica y arqueológica en el Norte de Asia Menor. Por José A. Weissberger. *Illustrations.*

AFRICA.

Africa—European Colonies. **Plas.**
B.S. Belge Etudes Col. **16** (1909): 557–579; **17** (1910): 339–354.
L'organisation administrative locale dans les diverses colonies et possessions africaines. Eléments de législation comparée. Par J. Plas.

Algeria—Climate. *Vierteljahrsschr. Naturfors. Ges. Zürich* **55** (1910): 91–102. **Rübel.**
Beiträge zur Kenntnis des photochemischen Klimas von Algerien. (Nordrand der Sahara, Grosser Atlas, Hochebene, Tell-Atlas, Mittelmeer.) Lichtklimatische Studien, III. Abhandlung. Von E. Rübel.

Atlantic Islands. **Gagel.**
Handbuch d. regionalen Geologie (*Steinmann and Wilckens*) **7** (1910): 10 Abt. pp. 32.
Die mittelatlantischen Vulkaninseln. Von C. Gagel. *Charts and Section.*

Belgian Congo—Railway. *Mouvement G.* **28** (1911): 37-43. **Wauters.**
Le chemin de fer l'Urua. Par A. J. Wauters. *Sketch-map.*
A further discussion of this scheme (see March number, p. 318).

Egypt—Nile basin. **Craig.**
Ministry of Finance, Egypt. Survey Department. Paper No. 17. The Rains of the Nile Basin and the Nile Flood of 1909. By J. I. Craig. Cairo, 1910. Size 10½ × 7, pp. 56 and x. *Maps, Charts, and Diagrams.*

Egyptian Sudan—Archæology. **Garstang and others.**
Meroë, the city of the Ethiopians, being an account of a first season's excavations on the site, 1909–10. By Dr. John Garstang, with chapters by the Rev. A. H. Sayce and F. Ll. Griffith. Oxford: Clarendon Press, 1911. Size 11½ × 8½, pp. viii. and 94. *Plans and Illustrations. Price* 31*s.* 6*d. net. Presented by the Publishers.*

French Chad Territories. *La G., B.S.G. Paris* **23** (1911): 101–104. **Meunier.**
Note sur la carte de la région Borkou-Tchad-Ouadaï. *Map.*

French Equatorial Africa—Niari. *B.G. Hist. et Descriptive* 1910 (1911): 55–66. **Romeu.**
Voyage au Congo (1909). Par M. A. de Romeu.
Geological and mineralogical researches in the basin of the Niari.

German East Africa—Mafia. *Globus* **98** (1910): 197–205. **Boxberger.**
Wandertage auf Mafia. Von Dr. Leo v. Boxberger. *Sketch-map and Illustrations.*

German South-West Africa. *M. Deutsch. Schutzgeb.* **23** (1910): 44–48. **Fischer.**
Eine Erkundung des Gebiets zwischen Omuramba u Owambo und Okawango. Von Oberleutnant Fischer. *Map.*

Kamerun—Botany. *M. Deutsch. Schutzgeb.* **23** (1910): 72–98. **Büsgen.**
Beiträge zur Kenntnis der Pflanzenwelt und der Hölzer des Kameruner Waldlandes. Von Prof. Büsgen. *Illustrations.*

Liberia. *National G. Mag.* **21** (1910): 719–729. **Forbes.**
Notes on the only American Colony in the World. By Edgar Allen Forbes. *Illustrations.*
This article is followed by an abstract of the report of the recent American Commission in Liberia (pp. 729–741, with illustrations).

Madagascar. *La G., B.S.G. Paris* **22** (1910): 377–388. **Buhrer.**
Le pays mahafaly. Par Lieut. Buhrer. *Maps.*
Study of a region adjacent to the west coast of Madagascar. One of the maps shows the geological formations.

Morocco—Anthropology. **Lefêvre and Nehlil.**
Renseignements Col. Afrique française. **19** (1910): 153–159, 222–230.
La région de Tafrata et les tribus qui l'habitent. Notice Historique et Géographique. Par le Lieutenant Lefèvre et L'Officier-interprète Nehlil. *Map.*

Morocco—Muluya. *La G., B.S.G. Paris* **22** (1910): 389–396. **Bernard.**
Quelques rectifications à la carte du Maroc. La vallée de la Moulouya. Par Augustin Bernard. *Maps and Diagrams.*
Based on recent explorations (see March number, p. 315).

Morocco—Muluya. *Rev. G. Col. y Mercantil, R.S.G. Madrid* 7 (1910): 422–447. **Pérez.**
La cuenca del Muluya. Por Antonio Garciá Pérez.

Nigeria—Forestry. *J. African S.* **10** (1911): 121–145. **Thompson.**
The Forests of Southern Nigeria. By H. N. Thompson. *Illustrations.*

Nigeria, Northern. **Falconer.**
The geology and geography of Northern Nigeria. By Dr. J. D. Falconer. London: Macmillan & Co., 1911. Size 9 × 5½, pp. xiv. and 296. *Maps and Illustrations. Price* 10*s. net. Presented by the Publishers.*

Nile Basin. **Pietsch.**
Das Abflussgebiet des Nil. Von Dr. Walter Pietsch. Berlin: E. Ebering, 1910. Size 9 × 6, pp. 114. *Sketch-maps and Diagrams.*

Portuguese East Africa. *National G. Mag.* **21** (1910): 807–830. **Barrett.**
Impressions and Scenes of Mozambique. By O. W. Barrett. *Illustrations.*

Rhodesia. **Mansfield.**
Viâ Rhodesia: a journey through Southern Africa. By Charlotte Mansfield. London: S. Paul & Co., [1911]. Size 10 × 6½, pp. xiv. and 430. *Maps and Illustrations. Price* 16*s. net.*

Rhodesia—Archæology. **Hall.**
Guide to Khami Ruins, near Bulawayo. By R. N. Hall, Bulawayo. [London], 1910. Size 8½ × 5½, pp. 84. *Plans and Illustrations. Presented by the Author.*

Sahara. *La G., B.S.G. Paris* **23** (1911): 161–192. **Villatte.**
A travers le Sahara. Du Tidikelt au Niger par le Ahaggar. *Map.*
Reference to M. Villatte's surveys was made in vol. **35**, p. 197.

Sahara—Western. **Doury and Bernard.**
Renseignements Col., Com. Afrique Franç., 1910: 353–371.
Du Guir à la Mauritanie. Par le Capitaine Doury. *Map.*
La Carte du Sahara Occidental. Par le Lieut. Bernard. *Map.*
Captain Doury supplies a number of itineraries in the Sahara south of Morocco from native information.

South Africa—Geodesy. *Beiträge Geophysik* **10** (1910): 519–551. **Bahn.**
Der Südafrikanische Meridianbogen. Von Wilhelm Bahn. *Sketch-map and Diagrams.*

South Africa—Magnetism. *South African J. Sc.* **7** (1910): 14–28. **Beattie.**
[South African Association. Presidential Address. Section A.] Earth Magnetism, with special reference to South Africa. By Prof. J. C. Beattie. *Sketch-maps.*

Togo—Minerals. *M. Deutsch. Schutzgebieten* **23** (1910): 57–67. **Koert.**
Ueber Goldvorkommen im östlichen Togo. Von Bezirksgeologen Dr. W. Koert. *Maps and Diagrams.*

Tunis—Communications. *B.S.G. Com. Paris* **32** (1910): 715–727. **Gallois.**
Routes et voies ferrées de Tunisie. Par Eugène Gallois. *Sketch-map.*

West Africa—Climate. *M. Deutsch. Schutzgeb.* **28** (1910): 1–43. **Siegberschmidt.**
Das Klima der Nieder-Guinea-Küste und ihres Hinterlandes. Von Dr. R. Siegberschmidt.

West Africa—Languages. **Migeod.**
The languages of West Africa. By F. W. H. Migeod. Vol. **1**. London: K. Paul & Co., 1911. Size 8½ × 5½, pp. viii. and 374. *Map. Price* 12*s.* 6*d. net.*

NORTH AMERICA.

America—Blow-pipe. *Petermanns M.* **57** (1911): [i.]; 71–73. **Friederici.**
Die geographische Verbreitung des Blasrohrs in America. Von Hauptm. a. D. Dr. Georg Friederici. *Map.*

Canada. **Copping.**

The golden land: the true story and experiences of British settlers in Canada. By Arthur E. Copping. London: Hodder & Stoughton, [1911]. Size 8 × 5½, pp. xvi. and 264. *Illustrations. Price 6s. Presented by the Publishers.*

Canada, Eastern. **Aflalo.**

A fisherman's summer in Canada. By F. G. Aflalo. London: Witherby & Co., 1911. Size 8 × 6, pp. xii. and 148. *Illustrations. Price 5s. net. Presented by the Publishers.*

Canada—Minerals. *B.G. Hist. et Descriptive* 1910 (1911): 37–54. **Romeu.**

Deux voyages dans l'Amérique du Nord (1905–1907). Par M. A. de Romeu.

Visits to the two newly discovered mineral localities of Cobalt in Ontario and Chibogomo in Quebec.

Canada—Mount Robson. *Alpine J.* **41** (1910); 293–305. **Amery.**

An Attempt on Mount Robson. By L. S. Amery. *Illustrations.*

Canada—New Brunswick. **Bailey.**

B. Nat. Hist. S. New Brunswick **6** (1909–10): 189–197.

The History of Curries Mountain—An old New Brunswick Volcano. By Dr. L. W. Bailey. *Sections.*

Canada—New Brunswick. **Ganong.**

B. Nat. Hist. S. New Brunswick **6** (1909–10): 85–109, 199–218.

Notes on the Natural History and Physiography of New Brunswick. Nos. 113 to 119. By W. F. Ganong. *Sketch-maps.*

Continuation of the series of instructive studies which has been coming out for some years.

Labrador. *Travel and Exploration* **5** (1911): 120–128. **Prichard.**

The Long Labrador Trail. By Hesketh Prichard. *Illustrations.*

On the journey made in 1910 (*Journal*, vol. **36**, p. 691).

Mexico—Language. **Griggs.**

Primer Diccionario de la Lengua Tarahumara. Por [Dr.] Jorge Griggs. Chihuahua, 1910. Size 8½ × 6, pp. 68. *Presented by the Author.*

North America—Geology. *American J. Sc.* **30** (1910): 403–411. **Ruedemann.**

On the Symmetric Arrangement in the Elements of the Paleozoic Platform of North America. By Rudolf Ruedemann. *Sketch-maps.*

North America—Phosphate deposits. **Matthew.**

B. Nat. Hist. S. New Brunswick **6** (1909–10): 121–126.

Phosphate Deposits of South Carolina and New Brunswick. By Dr. G. F. Matthew.

United States—Historical. **Hanna.**

The Wilderness trail; or the ventures and adventures of the Pennsylvania traders on the Allegheny path . . . By Charles A. Hanna. Two vols. New York and London: G. P. Putnam's Sons, 1911. Size 9½ × 6, pp. (vol. 1) xxiv. and 384; (vol. 2) vi. and 458. *Maps (facsimile, etc.) and Illustrations. Price 42s. net.*

United States—Mississippi river. **Chambers.**

The Mississippi river and its wonderful valley; twenty-seven hundred and seventy-five miles from source to sea. By Julius Chambers. New York and London: G. P. Putnam's Sons, 1910. Size 9½ × 6½, pp. xvi. and 308. *Maps and Illustrations. Presented by the Author.*

United States—Nebraska. *J.G.* **9** (1910): 85–92. **Condra.**

Geographic influences in the development of Nebraska. By G. E. Condra.

United States—New York. *B. Amer. G.S.* **42** (1910): 738–764. **Tarr.**

Location of the towns and cities of Central New York. By Ralph S. Tarr. *Maps.*

United States—Phosphates. *National G. Mag.* **21** (1910): 783–791. **Mitchell.**

Our Greatest Plant Food. By Guy Elliot Mitchell.

Like other recent writers, the author dwells on the urgent need of husbanding the American phosphate resources.

United States—Washington. *J. Geology* **18** (1910): 448–458. **Bretz.**

Glacial lakes of Puget Sound. Preliminary Paper. By J. Harlen Bretz. *Sketch-map.*

United States—Wyoming. *J. Geology* **18** (1910): 601–632. **Rich.**
The Physiography of the Bishop Conglomerate, South-Western Wyoming. By John Lyon Rich. *Sketch-maps and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine—Andes—Glacier. *Z. Gletscherkunde* **5** (1910): 133–143. **Hauthal.**
Der Bismarck-Gletscher. Ein vorrückender Gletscher in den Patagonischen Cordillere. Von Prof. Dr. R. Hauthal. *Sketch-map and Illustrations.*
See note in the April number, p. 450.

Bolivia—Phytogeography. **Herzog.**
Vegetationsbilder (*Karsten und Schenck*) **7** (1909): Plates 31–42.
Pflanzenformationen aus Ost-Bolivia. Von Dr. Th. Herzog. *Illustrations.*

Brazil. **Commission of Economic Expansion.**
Commissão d'Expansão Economica do Brazil. Brazil: its natural riches and industries (Foreign edition). Vol. 1. Paris: Aillaud & Co., 1910. Size 11 × 7½, pp. 384. *Maps, Illustrations, and Diagrams. Presented.*

Brazil—Bahia—Geology. *American J. Sc.* **30** (1910): 385–392. **Branner.**
The Geology and Topography of the Serra de Jacobina, State of Bahia, Brazil. By John C. Branner. *Sections.*

Brazil—Historical. *Rev. I. hist. e g. Brazileiro* **71** (1908): Pt. 2, 107–122. **Abreu.**
Vaz de Caminha e sua carta. Por J. Capistrano de Abreu.
Vaz de Caminha accompanied Cabral in 1500, and the letter in question describes the discovery of Brazil.

Brazil—Historical. *B.G. Hist. et Descriptive*, 1910 (1911): 276–306. **Eude.**
Anciennes capitaines de l'Amazonie. Etude de géographie historique. Par M. Emile Eude.

British Guiana—Georgetown. *Timehri* (*Georgetown*) **1** (1911): 42–52. **Hill.**
The nomenclature of Georgetown; its streets and districts. By Luke M. Hill.
The publication of this journal is resumed after a long interval.

British Guiana—Place-names. *Timehri* (*Georgetown*) **1** (1911): 53–56. **Rodway.**
Our river names. By J. Rodway.

South America—Chaco—Ethnology. **Quevedo.**
Las lenguas de tipo guaycurú y chiquito comparadas. Por el Prof. Samuel A. Lafone Quevedo. (De la Revista del Museo de La Plata, Tomo xvii.) Buenos Aires, 1910. Size 11 × 7½, pp. 7–68. *Facsimile Map.*

South America—Political. **Bingham.**
Causes of the lack of Political Cohesion in Spanish America. By Professor Hiram Bingham. (Reprinted from the *American Political Science Review*, vol. 4, No. 4, November, 1910.) Baltimore, 1910. Size 10 × 7, pp. 508–515. *Presented by the Author.*

Uruguay—Geology. *Petermanns M.* **56** (1910): 2 Halbbd. 306. **Guillemain.**
Der erste Versuch einer geologischen Karte von Uruguay. Von Dr. C. Guillemain. *Map.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Bureau of Census and Statistics.**
Commonwealth Bureau of Census and Statistics, Melbourne. Official year-book of the Commonwealth of Australia, containing authoritative statistics for the period 1901–1909. . . . No. 3, 1910. Published under the authority of the Minister of Home Affairs by G. H. Knibbs. Melbourne, 1910. Size 9½ × 6, pp. xxvi. and 1164. *Maps and Diagrams.*

Australasia. *C.R.A. Sc. Paris* **151** (1910): 1407–1410. **Hervé.**
Sur les instructions données par l'Institut national (I^re^ et 2^e^ classe) au capitaine Baudin pour son voyage de découvertes aux terres australes (1800–1804). Par M. Georges Hervé.
Notes on the MS. instructions preserved in the French naval archives.

Australia—Phosphate deposits. *P.R.S. Queensland* **22** (1910): 69–76. **Jensen.**
The origin and occurrence of Phosphate Rock, and the possibility of finding Phosphate Deposits in Australia. By Dr. H. J. Jensen.

New Guinea. *Deuts. Kolonialblatt* **22** (1911): 124–127. **Schultze.**

Von der deutsch-holländischen Grenzexpedition. Von Dr. Leonhard Schultze.

Account of the ascent of the Kaiserin Augusta river and explorations near the 141st meridian (see Monthly Record, April, p. 452).

New Guinea—Dutch. *Z. Ges. E. Berlin* (1911): 185–192. **Moszkowski.**

Vorläufiger Bericht über die Deutsche Mamberamo-Expedition in Niederländisch-Neu-Guinea. Von Max Moszkowski.

Referred to in the Monthly Record for May, p. 567.

POLAR REGIONS.

Arctic—North Pole. *Z. Ges. E. Berlin* (1911): 180–185. **Baschin.**

Zur Frage der Erreichung des Nördpols durch Peary. Von Otto Baschin. *Diagram.*

A careful discussion of Peary's probable route in the immediate neighbourhood of the pole.

Arctic—Tides. **Harris.**

Department of Commerce and Labor. Coast and Geodetic Survey. Arctic Tides. By Rollin A. Harris. Washington, 1911. Size 11½ × 9, pp. 104. *Charts.*

New Siberia Islands. *J. Victoria I.* **42** (1910): 35–57. **Whitley.**

The Ivory Islands in the Arctic Ocean. By the Rev. D. Gath Whitley.

A sketch of the progress of exploration of these islands from early times, and of their main characteristics.

Novaya Zemlya. **Shidlovsky.**

Bibliography of Northern Literature, from the material collected by the Northern Russian Society, Arkhangel. Part I.: Novaya Zemlya. By A. F. Shidlovsky. St. Petersburg, 1910. Size 10½ × 7, pp. 70. [In Russian.]

Novaya Zemlya. **Sosnovsky.**

General administration of agriculture and land-organisation. Materials for the study of Novaya Zemlya. Part I. edited by I. V. Sosnovsky. St. Petersburg, 1910. Size 10½ × 7, pp. viii., 124, and 68. *Maps and Illustrations.* [In Russian.]

A bibliography by A. F. Shidlovsky forms an appendix.

Polar Regions. **Bruce.**

Polar Exploration. By Dr. W. S. Bruce. (Home University Library of Modern Knowledge.) London: Williams & Norgate, [1911]. Size 6½ × 4, pp. 256. *Sketch-maps. Price* 1*s. Presented by the Publishers.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. *P.R.S. Queensland* **22** (1910): 59–64. **Jensen.**

The Climates of the Geological Past. By Dr. H. J. Jensen.

Climatology—Snow-line. *Petermanns M.* **57** (1911) [i.]: 57–60. **Paschinger.**

Schneegrenze und Klima. Vorläufiger Bericht über die Ergebnisse einer kritischen Schneegrenztabelle. Von Dr. Viktor Paschinger. *Map and Diagram.*

Frozen soil. *B.A. Imp. Sc. St. Pétersbourg* (1911): 51–60. **Sukačev.**

L'influence de la congélation perpétuelle sur le sol. Par V. N. Sukačev. [In Russian.]

Geomorphology. *Beiträge Geophysik* **10** (1910): 468–518. **Ziemendorff.**

Der Kontinentalschelf des Nordatlantischen Ozeans. Von Georg Ziemendorff. *Chart and Sections.*

Geomorphology—Cirques. **Michel and Koncza.**
B.S. Neuchâtel. G. **20** (1909–1910): 129–156.

Les entonnoirs et la genèse des formes du modelé des cirques glaciaires. Par G. Michel et M. de Koncza. *Maps and Illustrations.*

Geomorphology—Continents. *P.R. Irish A.* **28**, Sec. B. (1909): 1–28. **Scharff.**

On the evidences of a former Land-Bridge between Northern Europe and North America. By Dr. R. F. Scharff. *Maps and Illustrations.*

Geomorphology—Valleys. *J. Geology* **18** (1910): 117–124. **Chamberlin.**

Certain valley configurations in low latitudes. By T. C. Chamberlin and R. T. Chamberlin. *Illustration.*

Glaciers—Névé. *C.R.A. Sc. Paris* **151** (1910): 1083–1085. **Bernard and Mougin.**
Sur la stratification des névés et de la glace dans les régions élevées des bassins d'alimentation des glaciers. Note de MM. Bernard et Mougin.

Karst—Ground-water. *M. k.k. G. Ges. Wien* **53** (1910): 606–617. **Grund.**
Zur Frage des Grundwassers im Karst. Van Dr. Alfred Grund.
Corrects misconceptions of the author's views as to the hydrology of the Karst.

Limnology. *Münchener G. Studien* (*Günther*), No. 25 (1911): pp. 82. **Dirscherl.**
Die Anfänge einer wissenschaftlichen Seenkunde. Von Dr. Karl Dirscherl. *Illustr.*
Traces the early development of limnology.

Limnology—Seiches. **Oddone.**
Atti R.A. Lincei, Ser. V., Rendiconti, sc. fis. etc. **19** (1910): 2 Sem., 115–122.
Per lo studio delle cause del fenomeno delle sesse. Di Emilio Oddone.

Magnetism. **Negre.**
Études sur la boussole et sur le magnetisme terrestre. Par Georges Negre. (From *L'Echo Minier et Industriel*, Brussels, Novembre et Decembre 1910.) Size 12½ × 9, pp. [12]. *Sketch-map and Diagram.*

Meteorology—Circulation. *Meteorol. Z.* (1910): 488–492. **Köppen.**
Die Verschiebungen der Atmosphäre im Jahreslaufe und die Höhe des antarktischen Kontinents. Von W. Köppen. *Diagram.*

Meteorology—Refraction. **K.K. Hydrographisches Amt.**
Veröffentlichungen des Hydrographischen Amtes der K.K. Kriegs-Marine in Pola. Gruppe I. Nächtliche Kimmtiefen-Beobachtungen zu Verndella, ausgeführt 1902–03. Herausgegeben von der Abteilung "Sternwarte," Pola, 1904. Size 10 × 9½, pp. 20. *Diagram.*

Meteorology—Wind. *Meteorol. Z.* (1910): 492–499. **Hann.**
Zur Theorie der Aufsteigenden Talwinde. Von J. v. Hann.
See note in the Monthly Record, *ante*.

Oceanography. **Swedish Hydrographic-Biological Commission.**
Kungl. Jordbruksdepartementet, XXII., 1910. Resultaten af den Internationella Hafsforskningens arbete under åren 1907–1909 och Sverges andel daruti. Under medverkan af G. Schneider och W. Björck sammanfattade af Svenska Hydrografisk-Biologiska Kommissionens verkställande utskott, G. Ekman, O. Pettersson, och F. Trybom. Stockholm, 1910. Size 9 × 6, pp. 142. *Maps and Illustrations.*

Oceanography. *Scot. G. Mag.* **26** (1910): 617–624. **Murray.**
The Deep Sea. By Sir John Murray. *Illustrations.*
Includes a brief account of the recent cruise of the *Michael Sars*.

Oceanography—Atlantic. **Murray and Hjort.**
The *Michael Sars* North Atlantic Deep Sea Expedition 1910. Carried out under the auspices of the Norwegian Government and the superintendence of Sir John Murray and Dr. Johan Hjort. List of Observing Stations and particulars of the apparatus employed. Bergen, 1910. Size 10 × 7, pp. 16. *Chart.*
See Dr. Hjort's article in the *Journal* (May number, p. 500).

Oceanography—Baltic. **Jacobsen.**
Meddelelser Komm. Havundersøgelser; Hydrografi, **1** (1910): No. 14, pp. 20.
Gezeitenströme und resultierende Ströme im Grossen Belt in verschiedenen Tiefen im Monat Juni 1909. Von J. P. Jacobsen. *Sketch-map and Diagrams.*

Oceanography—Current. **Engeler.**
Ann. Hydrographie **38** (1910): 475–489, 536–547, 601–610.
Periodische und unperiodische Temperaturschwankungen der Benguela-Strömung. Von E. Engeler. *Diagrams.*

Oceanography—Current-meter. **Jacobsen.**
Conseil Internat. de la Mer; Publ. de Circonstance, No. 51 (1909): pp. 20.
Der Libellenstrommesser: ein Apparat zur Messung von Strömungen im Meere. Von J. P. Jacobsen. *Diagrams.*

Oceanography—Deposits. **Cole and Crook.**
Department of Agriculture and Technical Instruction for Ireland: Memoirs of the Geological Survey of Ireland. On rock-specimens dredged from the floor of the Atlantic off the coast of Ireland, and their bearing on submarine geology.

By Grenville A. J. Cole and T. Crook. Dublin, 1910. Size 9½ × 6, pp. 36. *Map, Illustrations, and Sections.*

Noticed in the Monthly Record (May number, p. 569).

Oceanography—Deposits. *B.I. Océanogr. Monaco*, No. 190 (1910): pp. 18. **Thoulet.**

Couleur des fonds marins. Par J. Thoulet.

Oceanography—Instrument. **Knudsen.**

Conseil Internat. de la Mer; Publ. de Circonstance, No. 50 (1909): pp. 12.

Ein Wasserschöpfer zur Benutzung während der Fahrt des Schiffes. Von Martin Knudsen. *Section and Illustrations.*

Oceanography—Mediterranean. **Lohmann.**

Internat. Rev. Hydrobiologie u. Hydrographie **2** (1909): 505–556; **4** (1910): 275–298.

Die Strömungen in der Strasse von Messina und die Verteilung des Planktons in derselben. Von H. Lohmann. *Maps and Illustrations.*

Oceanography—North Atlantic. **Grund.**

Internat Rev. Hydrobiologie, etc. **2** (1909): 31–61.

Strömungsbeobachtungen im Byfjord bei Bergen und in anderen norwegischen Fjorden. Mitteilung aus der Biologischen Station in Bergen, I. Von Dr. Alfred Grund. *Diagrams.*

Oceanography—North Sea—Fish. **Johansen.**

Meddelelser Komm. Havundersøgelser; Fiskeri **3** (1910): No. 8, pp. 142.

Bericht über die dänischen Untersuchungen über die Schollenfischerei und den Schollenbestand in der östlichen Nordsee, dem Skagerak und dem nördlichen Kattegat. Von A. C. Johansen. *Sketch-maps and Diagrams.*

Oceanography—Sea-water. **R. Istituto Idrografico.**

An. Idrogr., I. Idrogr., Genoa 6 (1907–9): 261–272.

Densità e temperatura dell' acqua superficiale del mare determinate durante la campagna di circumnavigazione della R. Nave "Calabria" (4 febbraio 1905—3 febbraio 1907).

Oceanography—Tables. **Ekman.**

Conseil Internat. de la Mer; Publ. de Circonstance, No. 49 (1910): pp. 48.

Tables for sea-water under pressure. By V. Walfrid Ekman.

Oceanography—Voyage. *G.Z.* **15** (1910): 581–586. **Mecking.**

Ueber die ozeanographischen Ergebnisse der Ausreise des Vermessungschiffs *Planet*. Von Dr. L. Mecking.

Phytogeography. *Ymer* **30** (1910): 65–87. **Birger.**

Kulturen och växternas vandringar. A. Selim Birger. *Maps and Illustrations.*

On the introduction and spread of new species in connection with cultivation.

Phytogeography—Alpine forests. **Künkele.**

Z. Deuts. u. Österr. Alpenv. **41** (1910): 6–17.

Der Hochgebirgswald. Von Th. Künkele.

River-erosion. *J. Geology* **18** (1910): 435–447. **Eakin.**

The influence of the Earth's rotation upon the lateral erosion of streams. By Henry M. Eakin. *Diagrams.*

Rivers. **Obruchef.**

V. A. Obruchef. On the question of the means of transport of the harder rocks along the banks of rivers. Tomsk, 1908. Size 11 × 7, pp. 12. *Diagrams.* [In Russian.]

Sounding Apparatus. *Ann. Hydrographie* **38** (1910): 687–690. **Horn.**

Selbsttätiger Lotapparat System Ferguson. Von A. v. Horn. *Diagrams.*

Volcanoes. **Brun.**

Nouvelles études de géochimie et de géophysique. Recherches sur l'exhalaison volcanique. Par Albert Brun. Geneva: Librairie Kundig, 1911. Size 12 × 9½, pp. 278. *Illustrations and Diagrams. Presented by M. Henry F. Montagnier.*

Zoogeography—Fish. **Thompson.**

Conseil Exploration de la Mer; Rapports et P.-V. **12** (1908–09): C, No. 2, pp. 42.

Report on the distribution, etc., of the cod, haddock and other round fishes. By D'Arcy Wentworth Thompson. *Sketch-maps and Diagrams.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial—Banana. *Petermanns M.*, Ergänzsh. **169** (1911): pp. 117. **Rung.**

Die Bananenkultur, geographisch, wirtschaftlich und kulturhistorisch betrachtet. Von Dr. Richard Rung. *Map and Illustrations.*

Disease—Malaria. *J. African S.* **10** (1911): 157–172. **Minchin.**

The Prevention of Malaria. By Prof. E. A. Minchin.

Disease distribution—Plague. *Petermanns M.* **57** (1911): [i]: 169–171. **Pöch.**

Die Geographische Verbreitung der Pest um die Wende des 19. und 20. Jahrhunderts. Von Dr. Rudolf Pöch. *Maps.*

Ethnology—Arabs. *Globus* **98** (1910): 316–319. **Banse.**

Die Geographische Bedeutung der Araber. Von Ewald Banse. *Map.*

Ethnology—Primitive maps. **Adler.**

The maps of primitive folk. By B. F. Adler. (Bulletin of the Imperial Society of Students of Natural History, Anthropology and Ethnography of the Imperial University of Moscow. Vol. **119**: Works of the Geographical Section, Part. 2.) St. Petersburg, 1910. Size 13 × 9½, pp. viii. and 350. *Facsimile Maps.* [In Russian.]

Historical. *B.S.G. Italiana* IV. **11** (1910): 1433–1441. **Bertolini.**

I quattro angoli del mondo e la forma della Terra nel passo di Rabano Mauro. **Nota** del Prof. G. Lod. Bertolini.

Contests the view that Rabano, in his work 'De Universo,' considers the earth to be quadrangular. A further note on the subject is contributed to a later number of the *Bollettino* (January, 1911) by Prof. C. Massa.

Historical—Columbus. **Vignaud.**

Études sur la vie de Colomb; 2e Série. Histoire critique de la grande entreprise de Christophe Colomb: comment il aurait conçu et formé son projet; sa présentation à différentes cours: son acceptation finale: sa mise à exécution: son véritable caractère. Par Henry Vignaud. 2 vols. Paris: H. Welter, 1911. Size 9 × 6, pp. (vol. 1) xxxiv. and 730; (vol. 2) xx. and 704. *Price* 30 *fr. Presented by the Publisher.*

Historical—Columbus. **Vignaud.**

L'ancienne et la nouvelle campagne pour la canonisation de Christophe Colomb. Par Henry Vignaud. (Extrait du *Journal de la Société des Américanistes de Paris;* Nouvelle Serie, Tome VI.) Paris, 1909. Size 11 × 7, pp. 32.

Historical—Cortereal. *Petermanns M.* **56** (1910) 2 Halbbd.: 313–315. **Björnbo.**

Die echte Corte-Real-Karte. Von Dr. Axel Anton Björnbo.

Shows that the "Oliveriana" map most nearly represents Cortereal's original (see May number, p. 571).

Historical—Prince Henry. **Beazley.**

Prince Henry of Portugal and the African crusade of the Fifteenth Century. By C. Raymond Beazley. (Reprinted from the *American Historical Review*, vol. **16**, No. 1, October, 1910.) Size 10½ × 7, pp. 23.

Historical—Silk-routes. **Herrmann.**

Die alten Seidenstrassen zwischen China und Syrien: Beiträge zur alten Geographie Asiens. Von Albert Herrmann. I. Abteilung. (Quellen und Forschungen zur alten Geschichte und Geographie; herausgegeben von W. Sieglin; Heft 21.) Berlin: Weidmann, 1910. Size 10 × 6½, pp. viii. and 130. *Map.*

This interesting paper will be specially noticed.

History of Cartography. **Blázquez.**

Rev. G. Col. y Mercantil, R.S.G. Madrid **7** (1910): 81–98.

Una joya de la cartografía americana del siglo xvi. Por Antonio Blázquez. *Facsimiles.*

On a map by Capitan Diego Palomino, *circ.* 1550, in which contour-lines were used to represent relief.

BIOGRAPHY.

Dominik. *Deuts. Kolonialblatt* **22** (1911): 116–120. **Engelbrechten.**

Zu Major Dominiks Gedächtnis. Von Leutnant v. Engelbrechten.

Major Dominik, who died in December 1910, was one of the most active pioneers in the Kamerun.

Moll. *La G., B.S.G. Paris* **23** (1911): 1–4. **Gouraud.**

Le Lieutenant-Colonel Moll. Par le Colonel Gouraud. *Portrait.*

Schleinitz. *Ann. Hydrographie* (1911): 1–2. **Ahlefeld.**

Vize-Admiral a. D. Exzellenz Frhr. v. Schleinitz. Von Vize-Admiral a. D. v. Ahlefeld.

Admiral von Schleinitz, who has lately died, is best known to geographers for his voyage of scientific investigation through the three great oceans at the time of the transit of Venus in 1874 (see April number, p. 455).

Toscanelli. **Uzielli.**

Gustavo Uzielli. In memoria di Paolo dal Pozzo Toscanelli. (Estratto dalla *Miscellanea storica della Valdelsa*, Ann. xviii., fasc. 3.) Castelfiorentino, 1910. Size 9½ × 6½, pp. 14.

Wahlberg. *Ymer* **30** (1910): 285–300. **Grönberg.**

Johan August Wahlberg och hans resor i Sydafrika. Till hundraårsdagen af hans födelse. Af Gösta Grönberg. *Sketch-map and Portraits.*

The subject of this memoir reached the upper Limpopo during journeys made between 1839 and 1845, and the Okavango between 1854 and 1856.

GENERAL.

Exhibitions. **[Ludwig Salvator.]**

Einiges über Welt-Ausstellungen. [Vom Erzherzog Ludwig Salvator.] Prague: H. Mercy Sohn, 1911. Size 8½ × 5½, pp. 38.

French Colonies—Railways. **Godfernaux.**

Les chemins de fer coloniaux français. Par R. Godfernaux. Paris: H. Dunod and E. Pinat, 1911. Size 12½ × 9, pp. ii. and 440. *Maps, Plans, Profiles, and Illustrations. Price 27 fr. Presented by the Publishers.*

Geographical Terms. *Riv. G. Italiana* **17** (1910): 488–497, 558–573. **Lorenzi.**

Le racolte di termini geografici dialettali: loro attinenze e limiti. Appunti e considerazioni di Arrigo Lorenzi.

Geography. **Newbigin.**

Modern geography. By Marion J. Newbigin. (Home University Library of Modern Knowledge.) London: Williams & Norgate, [1911]. Size 7 × 4½, pp. 256. *Sketch-maps and Diagrams. Price 1s. net. Presented by the Publishers.*

Geography—Congress.

Neuvième Congrès International de Géographie; Genève, 27 Juillet—6 Août 1908. Compte Rendu des travaux du Congrès, publié au nom du Comité d'Organisation par Arthur de Claparède. 2 vols. Geneva, 1909–1910. Size 9½ × 6, pp. (vol. 1) xvi. and 476; (vol. 2) xii. and 576. *Maps, Illustrations, and Diagrams.*

Geography—Text-book. **Heaton.**

The Junior Scientific Geography. Book I. Physical geography. By Ellis W. Heaton. London: Ralph, Holland & Co., [1911]. Size 7½ × 5, pp. viii. and 152. *Sketch-maps and Diagrams. Price 1s. 3d. net. Presented by the Publishers.*

Hints to Travellers—Photography. **Kuhfahl.**

Z. Deuts. u. Österr. Alpenv. **41** (1910): 30–45.

Die Photographie in den Alpen. Von Dr. Gustave Kuhfahl. *Illustration.*

Hints to Travellers. **Harford.**

Hints on outfit for travellers in tropical countries. By Dr. Charles Forbes Harford. 2nd Edit. London: The Royal Geographical Society [Extra Publication], 1911. Size 6½ × 5, pp. 66.

Mediterranean Lands. **Baedeker.**

The Mediterranean: sea-ports and sea routes, including Madeira, the Canary Islands, the coast of Morocco, Algeria, and Tunisia. Handbook for travellers by Karl Baedeker. Leipzig: K. Baedeker (London: T. F. Unwin), 1911. Size 6½ × 4, pp. xxxvi. and 608. *Maps and Plans. Price 12s. Presented by the Publisher.*

Outfit.

Modern Medical Equipments. London: Burroughs, Wellcome & Co., [1911]. Size 8 × 5, pp. 80. *Illustrations. Presented by the Publishers.*

A description of the various medical equipments supplied by the firm.

Photography—Diary.

The Wellcome Photographic Exposure Record and Diary, 1911. London: Burroughs, Wellcome & Co. Size 5½ × 5, pp. 280. *Illustrations. Presented by the Publishers.*

Statistics. **Birot.**

Statistique annuelle de géographie comparée, 1910. Par Jean Birot. Paris: Hachette et Cie., 1910. Size 8½ × 5½, pp. 32.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

British Isles—London. **Stanford.**

Stanford's Indexed Atlas of the County of London, with parts of the adjacent Boroughs and Urban Districts. With a preface by Sir Laurence Gomme. Scale 1: 15,840 or 4 inches to 1 stat. mile. London: Edward Stanford, 1911. *Price 7s. 6d.*

A useful and handy-sized atlas, measuring 10 by 6 inches. It shows the whole of the county of London and parts of adjacent boroughs on a map in 84 sections. Although very full of information and containing a great number of names, it is remarkably clear, chiefly owing to good draughtsmanship and the judicious selection of the colours in which the map is printed. The index to streets, buildings, etc., is specially complete and well arranged, so that any name in the atlas can be found in a moment, while the same reference letters serve to find the same locality on two other smaller maps, one of which shows the height above sea-level, and the other the surface geology.

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from April 1 to 30, 1911.

1-inch scale maps:—

England. 3rd edit. In Outline. Engraved. Sheets: 78, 194 (209, 192). *Price 1s. each.*

4 miles to 1 inch scale maps:—

England, sheet 11. 2nd edit. Engraved. *Price 1s. 6d.*

6-inch—County maps:—

Cheshire, 10 sheets. **Hampshire**, 5 sheets. **Lancashire**, 7 sheets. **Sussex**, 5 sheets. **Yorkshire**, 2 sheets. *Price 1s. each.*

25-inch—County maps:—

Berkshire, 8 sheets. **Cheshire**, 11 sheets. **Hampshire**, 19 sheets. **Lancashire**, 18 sheets. **Sussex**, 15 sheets. **Yorkshire**, 32 sheets. *Price 3s. each.*
(*E. Stanford, London Agent.*)

Europe. **Johnston.**

Bathy-orographical map of Europe. Scale 1: 5,100,000 or 1 inch to 90 stat. miles. Edinburgh and London: W. & A. K. Johnston, Ltd., [1911]. *Price 12s., mounted on rollers and varnished. Presented by the Publishers.*

One of a series of wall maps now in course of publication, showing relief of land on the layer system, by eight shades of green, buff and brown at the following intervals: Below sea-level, 0–300, 300–600, 600–1500, 1500–3000, 3000–6000, 6000–10,000 feet. The map is clear and not overcrowded with names, but the general effect would have been improved if some other shade instead of bright green had been used for the lower levels. Depths of water are shown by different tints of blue in the usual manner, the lines selected being 100, 500, 1000, and 2000 fathoms.

France. **Frater.**

Carte de la Frontière Nord-Est de la France. Par le Colonel Frater. 9e Édition (1909). Scale 1: 864,000 or 1 inch to 13·6 stat. miles. Paris: Erhard Frères, 1909.

France. **Service Géographique de l'Armée, Paris.**

Carte de France. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheet xxxvi.-20, Ballon d'Alsace. Paris: Service Géographique de l'Armée, 1911. *Price* 1.60 *fr. each sheet.*

Germany. **K. Preuss. Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1,100,000 or 1 inch to 1·6 stat. mile. Kupferdruck-ausgabe. Sheets: 29, Cranz; 49, Pillau; 435, Hersfeld; 459, Dillenburg. Berlin: R. Eisenschmidt, 1910. *Price* 1.50*m. each sheet.*

Switzerland. **Commission Géologique Suisse.**

Carte géologique de la Suisse publiée par la Commission Géologique de la Société Helvetique des Sciences naturelles. Carte Spéciale No. 60. Carte géologique des Hautes-Alpes Calcaires entre Le Lizerne et La Kander. Par Maurice Lugeon. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Bern: A. Francke, [1911]. *Presented by the Swiss Geological Commission.*

Turkey. **Diest and Groll.**

Wand-Karte des Osmanischen Reiches. Von W. von Diest und Dr. M. Groll. Scale 1 : 1,250,000 or 1 inch to 19·7 stat. miles. 4 sheets. Berlin: Gea-Verlag, 1911.

A school wall map of the Turkish Empire, boldly drawn and printed in colours. It is specially interesting at the present time, as it shows at a glance the proposed Euphrates railway with its connections. Lines open and those under construction are also given in red. Considerable attention has been paid to the means of communication, and roads, caravan tracks, and telegraph lines are all well indicated. It is evident that the latest material has been used in the construction of the map, including maps recently published by this Society. The lake formed by the lower course of the Euphrates near its junction with the Tigris is, however, not shown. The relative importance of towns is seen at once by the symbols employed, and in many instances the approximate number of inhabitants is given in figures under the town-name. The relief is shown by shading and colour tinting. The map is in four sheets, each of which measures 30 inches by 42 inches.

ASIA.

Asia Minor. **Turkish General Staff.**

Map of Asia Minor. [In Turkish character.] Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheets: Adramyti, Akshehr, Balikesri, Beyji, Brussa, Constantinople, Hassan, Kala, Ispir, Ismid, Kale, Sultanie, Kutaia, Kilia, Panderma, Rize, Sinav, Soma, Smyrna. Constantinople: Turkish General Staff, [1911].

As no regular survey of Asia Minor based upon an accurate system of triangulation exists, all maps of the country necessarily consist of compilations from such cartographical material as is available. This varies considerably in value and reliability, for while in some districts it is of the roughest character, in others the work has been done with considerable care, and includes railway surveys and route traverses adjusted to positions determined by astronomical observations. The largest map of the country hitherto published is that by Dr. R. Kiepert, on the scale of 1 : 400,000, and it is evidently upon this that the new Turkish map mentioned above has, in the main, been taken, although there are indications in places of other material having been utilized. The map, the lettering of which is in Turkish, will eventually consist of 134 sheets, only 17 of which are yet published.

India. **Böllert.**

Volksdichte in der oberen Gangesebene. Auf grund des "Census of India" vom Jahre 1901 entworfen und gezeichnet von Paul Böllert. Scale 1 : 2,500,000 or 3 inch to 39·5 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1911, I., Tafel 33. Gotha: Justus Perthes, 1911. *Presented by the Publisher.*

Manchuria. **Pöch.**

Pestkarte de Mandschurei. Entworfen von Dr. Rudolf Pöch. Scale 1 : 5,000,000 or 1 inch to 78·9 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1911, I., Tafel 35. Gotha: Justus Perthes, 1911. *Presented by the Publisher.*

Tonkin. **Service Géographique de l'Indo-Chine.**

Cartes des Deltas du Tonkin et du Thanh-Hoa. Scale 1 : 25,000 or 2·5 inches to 1 stat. mile. Sheets: 64, Cho-Ganh; 65, Phuc-Nhac; 66, Quat-Lam; 67, Kien-Hanh; 68, Bien-Son; 69, Phat-Diem; 70, Van-Ly; 71, Yen-Lang; 72, Yen-

Dinh; 73, Son-Cu; 73 *bis*, Cua-Day; 76, Lach-Truong. Hanoi: Service Géographique de l'Indo-Chine, 1904–06. *Price* 1 *piastre each sheet.*

AFRICA.

Africa. **Geographical Section, General Staff.**

Map of Africa. Compiled in the Geographical Section, General Staff. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: North B–31, F, Aiede; North B–32, A, Lokoja North B–32, E, Donga; North C–31, D, Illo; North C–31, K, Bussa; North C–31, L, Kontagora; North C–31, Q, Jebba; North C–31, R, Bida; North C–31, W. Illorin; North C–31, X, Pategi; North C–32, A, Gwari; North C–32, B, Zaria; North C–32, C, Kano South; North C–32, D, Birnin Kudu; North C–32, G, Koriga; North C–32, H, Girku; North C–32, I, Leri; North C–32, J, Bauchi; North C–32, K, Gombe; North C–32, L, Burmi; North C–32, N, Abuja; North C–32, O, Bukuru; North C–32, P, Wase; North C–32, Q, Muri; North C–32, S, Baro; North C–32, T, Nassarawa; North C–32, U, Lafia Beriberi; North C–32, V, Ibi; North C–32, W, Amar; North C–33, A, Kaba; North C–33, B, Maidugari. London: E. Stanford; Sifton Praed; T. Fisher Unwin, 1911. *Price* 1*s.* 6*d. each sheet. Presented by the Director of Military Operations.*

Algeria. **Service Géographique de l'Armée, Paris.**

Carte de l'Algerie. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheet 329, Sebdou. Paris: Service Géographique de l'Amée, 1911. *Price* 1.50 *fr. each sheet.*

Angola. **Almeida.**

Das portugiesische Grenzgebiet gegen Deutsch-Südwestafrika zum Verfolg der militarischen Operationen im Distrikt Huilla. Nach einem portugiesischen Original des Hauptmanns João d'Almeida. Scale 1 : 4,500,000 or 1 inch to 71·02 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1911, I., Tafel 10. Gotha: Justus Perthes, 1911. *Presented by the Publisher.*

AMERICA AND WEST INDIES.

Canada. **Dept. of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 21, Turtle Mountain, revised to February 13, 1911; 70, Moose Mountain, revised to December 30, 1910; 119, Regina, revised to January 23, 1911; 163, Donald, revised to January 14, 1911; 169, Touchwood, revised to December 20, 1910; 170, Yorkton, revised to February 27, 1911; 214, Rocky Mountain House, revised to January 26, 1911; 366, Saddle Lake, revised to December 6, 1910. Ottawa: Department of the Interior, Topographical Surveys Branch, 1911. *Presented by the Department of the Interior, Ottawa.*

Canada. **Dept. of the Interior, Ottawa.**

Northern Alberta. Scale 1 : 792,000 or 1 inch to 12·5 stat. miles. 5th edit., corrected to January 1, 1911. Ottawa: Department of the Interior, Topographical Surveys Branch, 1911. *Presented by the Department of the Interior, Ottawa.*

Chile. **Oficina de Mensura de Tierras, Santiago.**

Mapa de Chile. Scale 1 : 500,000 or 1 inch to 7·8 stat. miles. Sheets: 17°–19° S. Lat.; 41°–43° S. Lat.; 43°–45° S. Lat.; 45°–47° S. Lat. Santiago: Oficina de Mensura de Tierras, 1910. *Presented by the Director, Oficina de Mensura de Tierras, Santiago.*

Colombia. **Robelin.**

República de Colombia. Por L. Robelin. Scale 1 : 1,940,000 or 1 inch to 30·6 stat. miles. [Bogotá, 1911.]

A roughly drawn and highly coloured map important as showing the new departments according to the rearrangement of 1910. It is, however, surprising to find Panama still included in Colombia and shown as a department in the table at the foot of the map. An inset of Bogotá is given as an inset.

North America. **Cora.**

Carta della America del nord, Fisica e Politica, costrutta e disegnata dal Prof. Guido Cora. Scale 1 : 12,500,000 or 1 inch to 197·3 stat. miles. Turin : G. B. Paravia, [1911]. *Price 2L. Presented by the Publishers.*

This forms one of a series of small coloured wall maps intended for use in schools and offices. Little can be said in its favour, and it is far too confused and indistinct for educational purposes. Below the map is a table giving area and population of principal countries and states.

United States. **Rand, McNally & Co.**

Rand, McNally's indexed pocket map of North Carolina. Scale 1 : 897,040 or 1 inch to 14 stat. miles. Chicago and New York : Rand, McNally & Co., 1911. New edition.

West Indies. **[Topographical Dept., The Hague.]**

Topographische Kaart van Curaçao. Scale 1 : 20,000 or 3·2 inches to 1 stat. mile. 18 sheets. The Hague, [Topographical Department, 1910].

An excellent large-scale topographical map, based upon triangulation, and carefully drawn and printed in well-selected colours. Heights are shown in brown contours, the 50-metre line being clearly distinguished.

PACIFIC ISLANDS.

German New Guinea. **Sachse.**

Uebersichtskarte von Kaiser-Wilhelms-Land (Deutsch-Nord-Neuguinea) und die Reise der deutsch-niederland. Grenzkommission vom 8 September bis 22 November 1910. Von Hauptmann F. J. Sachse. Scale 1 : 2,000,000 or 1 inch to 31·5 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1911, I., Tafel 41. Gotha : Justus Perthes, 1911. *Presented by the Publisher.*

GENERAL.

World. **Pöch.**

Erdkarte der Ausbreitung der Pest am Ende des 19. und am Anfang des 20. Jahrhunderts. Entworfen von Dr. Rudolf Pöch. Equatorial scale 1 : 80,000,000 or 1 inch to 1262·6 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1911, I., Tafel 34. Gotha : Justus Perthes, 1911. *Presented by the Publishers.*

World. **St. Martin and Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodésiques, etc., avec un texte analytique. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Carte No. 55 Asie ; Feuille X. Indo-Chine. Paris : Hachette & Cie., 1911. *Presented by the Publishers.*

This sheet includes the region from the mouths of the Ganges to Hong Kong, and the central part of Yunnan to Cochin China. It forms sheet X of the ten-sheet map of Asia contained in this atlas, on the scale of 1 : 5,000,000, of which four are now published.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March, 1911. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 935, Plans in the Flores sea : Tanah Jampea, Kassi Tallu islands, 2*s*. **New Editions**—No. 1511, England, west coast : Newquay to Holyhead, 3*s*. 1170*a*, Wales, west coast : Holyhead to Great Ormes head, 3*s*. 3435, Plans on the east coast of Sweden : Plans added : Järnäs Hamn, Husum, Hudiksvall. Söderhamn, 2*s*. 2281, Norway, west coast : The Naze to Karmö, 3*s*. 1728, Italy : Gulf of Naples, 3*s*. 3660, Gulf of Aden : Aden harbour, 3*s*. 2404, Malacca strait : Singapore main strait, 2*s*. 1995, Malacca strait : Singapore road, 3*s*. 941*b*, Eastern archipelago, western portion, 3*s*. 2732, Plans of anchorages in Java, Bali, and Lombok ; Plans added : Labuan Tring bay, Kombal bay, Telong Blongas and Silung Belanak, Telok Awang, Bangsal Barat anchorage, Labuan Chari anchorage,

Ampenan road, 2*s*. 2823, China, north sea coast: Wei hai wei harbour and approaches, 3*s*.
(*J. D. Potter, Agent.*)

America—Great Lakes. **U.S. Weather Bureau.**
Meteorological charts of the Great Lakes, May, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Atlantic, North. **U.S. Hydrographic Office.**
Pilot chart of the North Atlantic Ocean, April, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Atlantic, North. **U.S. Weather Bureau.**
Meteorological chart of the North Atlantic Ocean, May, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Indian Ocean. **U.S. Hydrographic Office.**
Pilot charts of the Indian Ocean, May and June, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **U.S. Weather Bureau.**
Meteorological chart of the Indian Ocean, May, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Pacific, North. **U.S. Weather Bureau.**
Meteorological chart of the North Pacific Ocean, May, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

PHOTOGRAPHS.

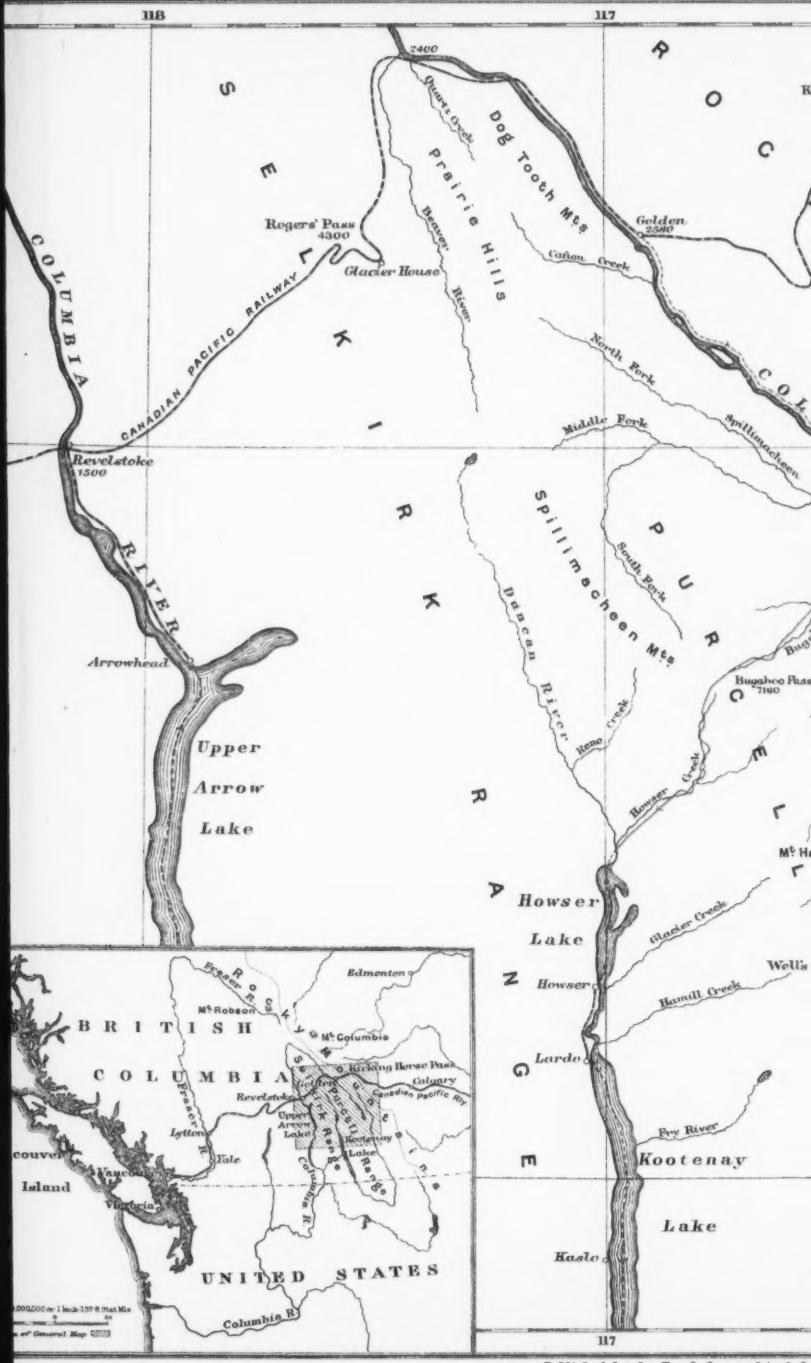
New Zealand. **Head.**
Thirty-six photographs of the New Zealand Alps, taken by Captain Bernard Head. *Presented by Captain Bernard Head.*

Several of these are panoramas, and altogether they form a set that will doubtless prove of interest to the mountaineer and student of glacial phenomena.

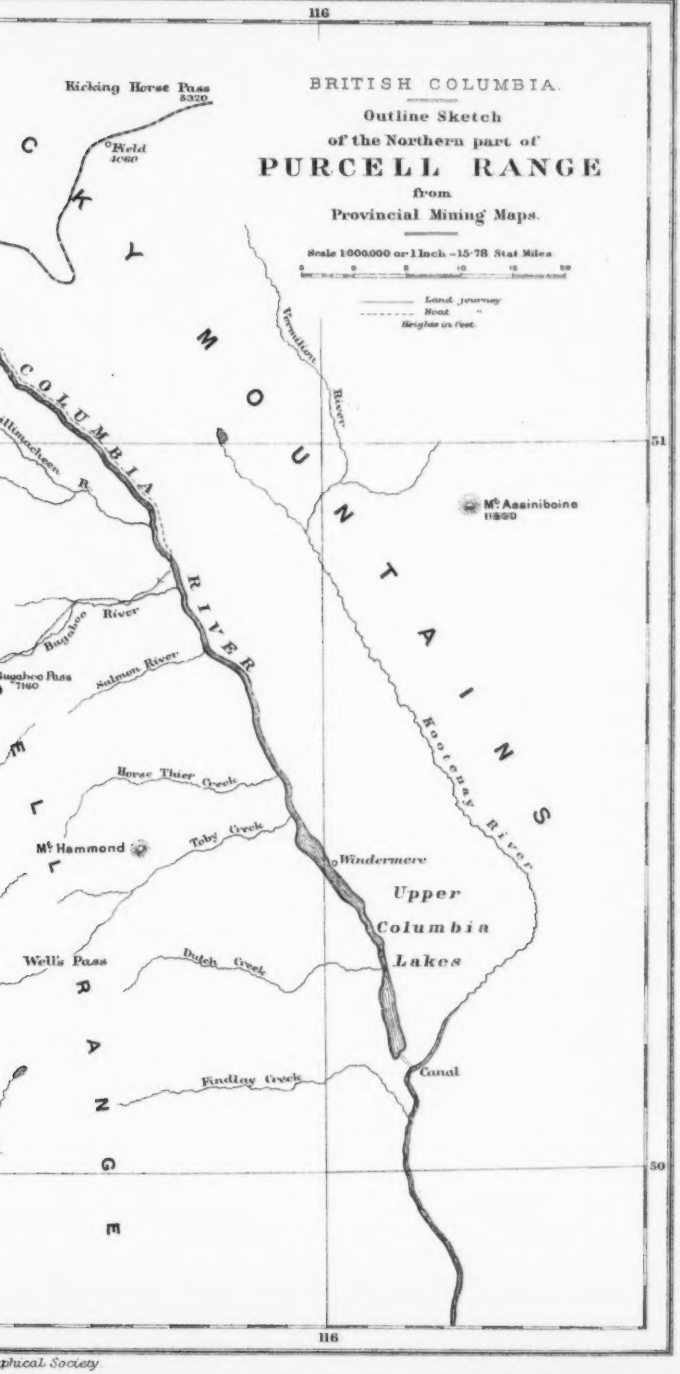
(1) Looking across Mueller glacier from Bernard pass; (2) Snow and rotten rock at the top of Bernard pass; (3) McKerrow glacier; (4) Looking towards head of McKerrow glacier; (5) View from Douglas saddle; (6) Douglas glacier falling over cliff; (7) McKerrow and Douglas glaciers; (8) Mounts Sefton and Cook; (9) Douglas saddle and glacier; (10) Copland valley and Mount Sefton; (11) Copland valley; (12) Douglas and FitzGerald glaciers; (13) Mount Sefton; (14) Douglas icefall; (15) Waterfall, east branch of Matukituki river; (16) View from Camp on east branch of Matukituki river; (17–19) Views from east branch of Matukituki river; (20) The Rob Roy glacier; (21) Looking down the valley, west branch of Matukituki river; (22) Looking up the valley, west branch of the Matukituki river; (23) Mount Earnslaw; (24) Hanging glacier in Aspiring range; (25) View from bivouac above west branch of Matukituki river; (26) Mount Aspiring from above east branch of Matukituki river; (27 and 28) Mount Aspiring; (29) Gap leading to Maude Frances glacier; (30) Distant view of Mount Aspiring; (31) Lake Wanaka near Pembroke; (32) View of burnt bush and Aspiring range looking up west branch of Matukituki river; (33) Looking up west branch of Matukituki river; (34) View from saddle dividing west branch of Matukituki river from west coast; (35) Mount Aspiring; (36) Head of west branch of Matukituki river valley.

N.B. It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

51
Vancouver
Island

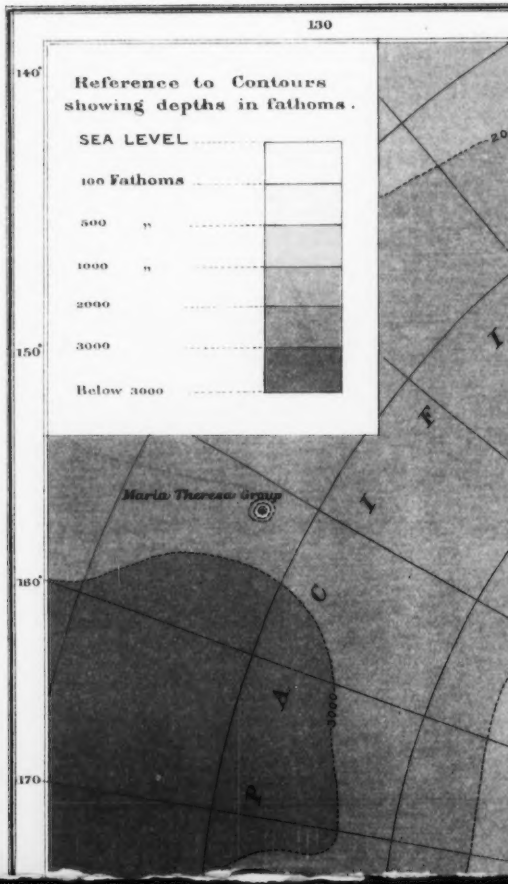


Published by the Royal Geographical So



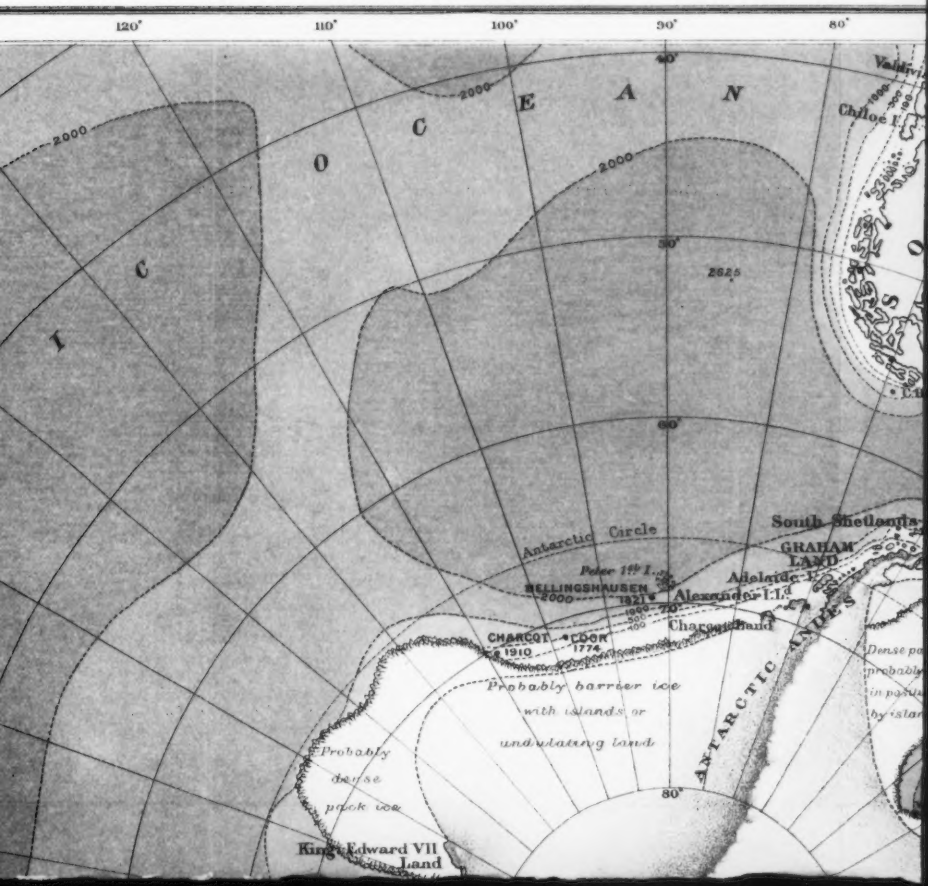
phical Society.

PURCELL RANGE
Longstaff.

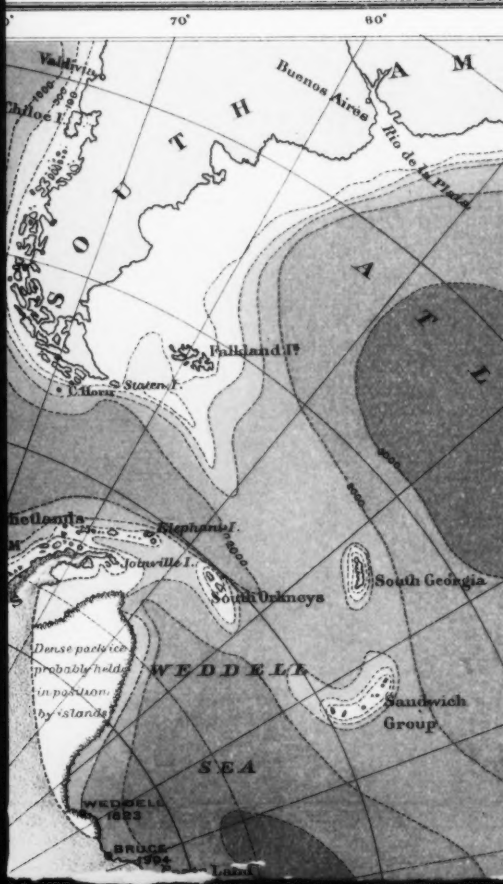

130
140°
150°
180°
170
Reference to Contours showing depths in fathoms.
SEA LEVEL
100 Fathoms
500 "
1000 "
2000
3000
Below 3000
Maria Theresa Group
PACIFIC
3000

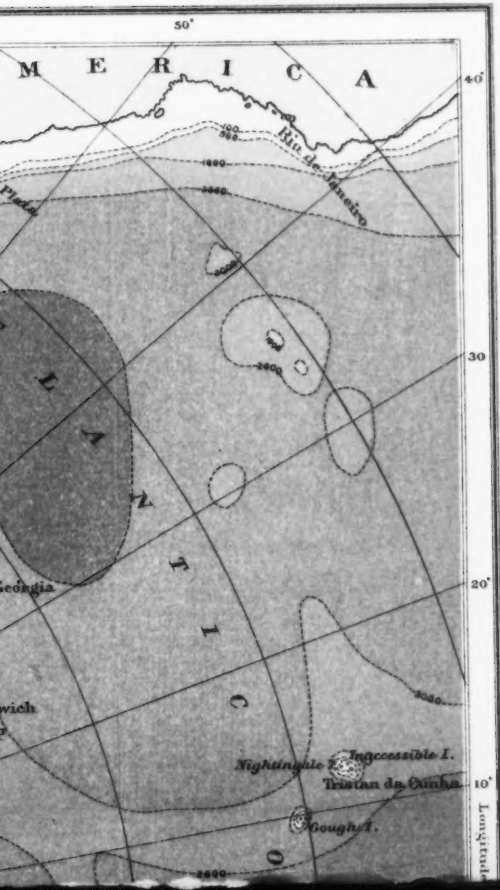
SOUTH POLAR REGIONS

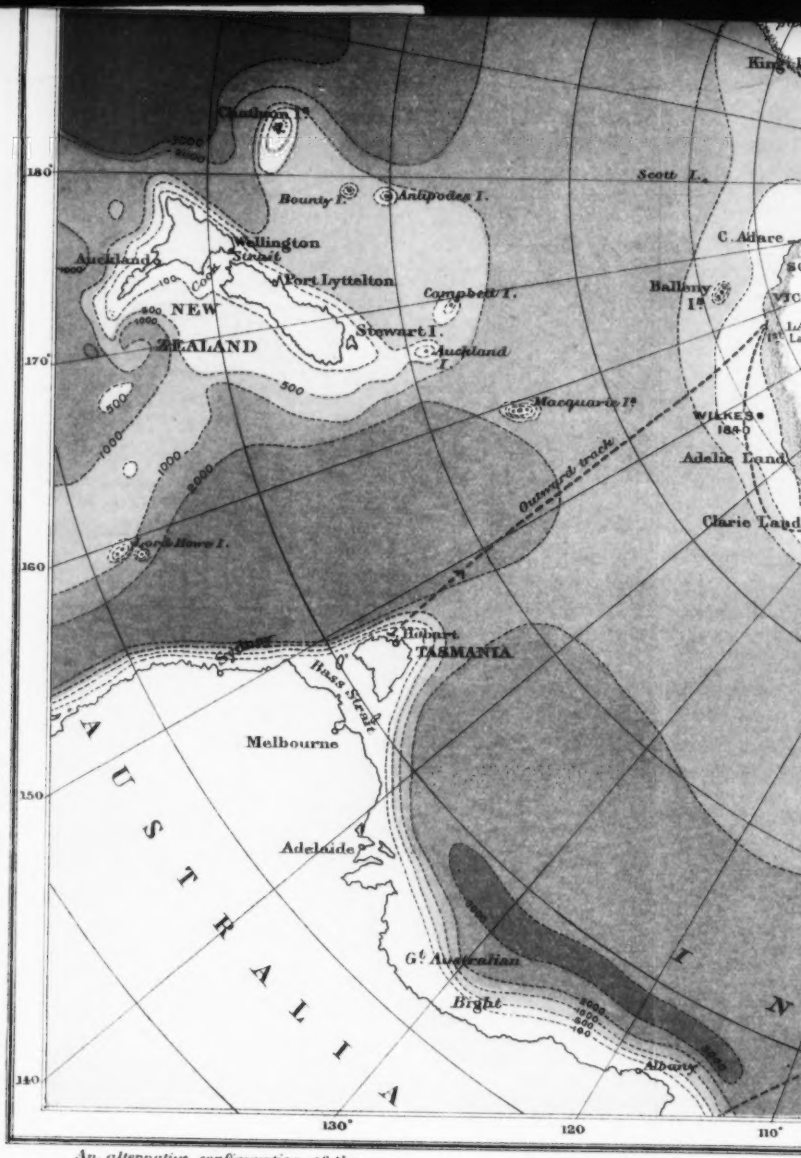
With the Antarctic Continent drawn to illustrate the probable t
as deduced from present available data
by
D. MAWSON, D.Sc. B.E.



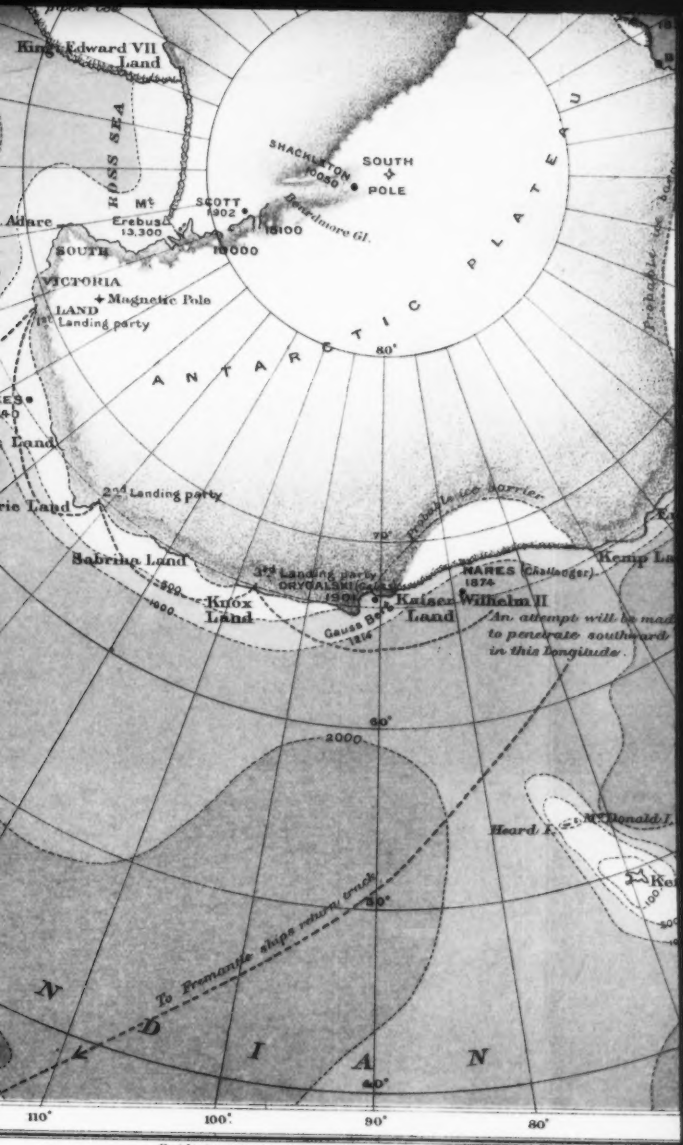
obable topography




50°
M E R I C A
40°
Rio de Janeiro
Plata
30
L A N T I C O
20°
Georgia
wich
Nightingale I.
Inaccessible I.
Tristan da Cunha
10°
Gough I.
Longitude
2000



An alternative configuration of the supposed Antarctic Continent is shown on the block map in Dr Mawson's paper.



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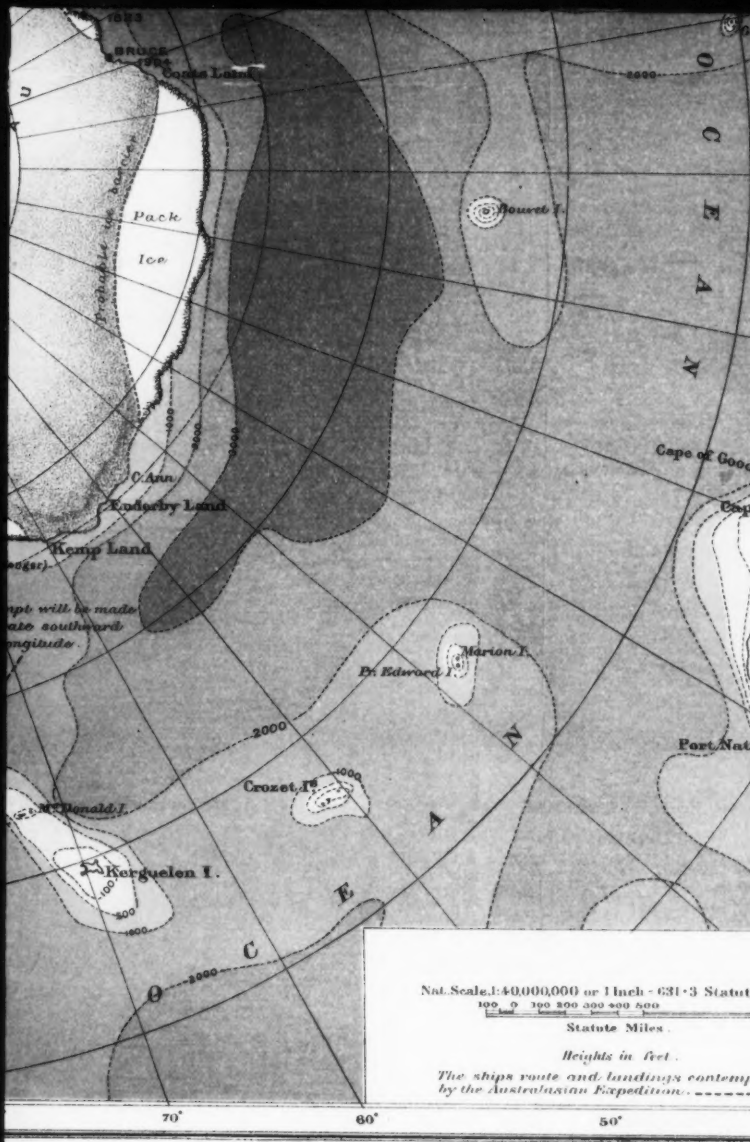
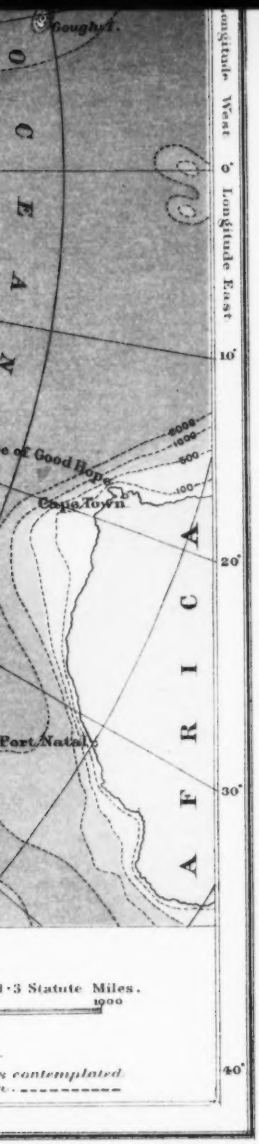

BRUCE
1903
Coats Land
Pack
Ice
Probable ice barrier
Bouvet I.
O C E A N
2000
Cape of Good
C. Ann
Enderby Land
Kemp Land
Marion I.
Pr. Edward I.
2000
Port Nat
Crozet Is
1000
M.Donald I.
Kerguelen I.
100
500
1000
2000
C E A N
Nat. Scale 1:40,000,000 or 1 Inch = 631·3 Statut
100 0 100 200 300 400 500
Statute Miles.
Heights in feet.
The ships route and landings contemp
by the Australasian Expedition.
70°
60°
50°

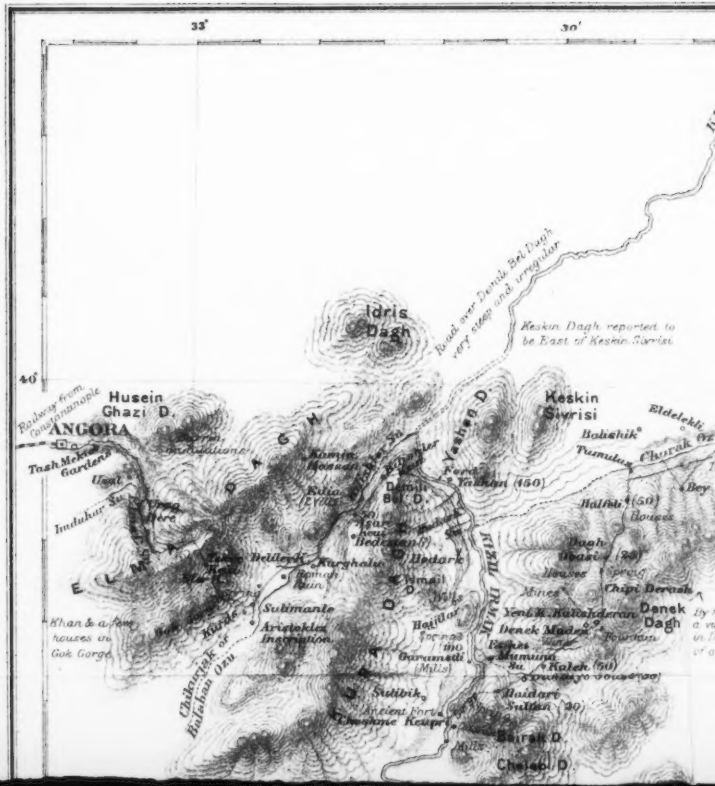
SOUTH PO

MAW

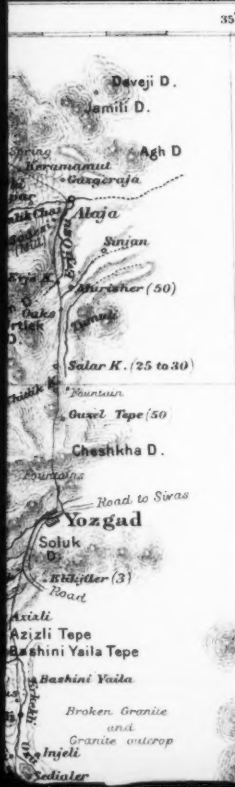


TH POLAR REGIONS

MAWSON.


33'
30'
40'
Idris Dagh
Road over Demirli Bel Pass very steep and irregular
Keskin Dagh reported to be East of Keskin Sivrisi
Husein Ghazi D.
ANGORA
Railway from Constantinople
Tash Medresseh
Gardens
Imdukur Su
Keskin Sivrisi
Balishik
Tumulus
Eldelekli
Chiurak
Beg
Halish (50) Houses
Dagh Orak (20) Houses
Chipi Dereh
Denek Dagh
Yeni K. Kulakamran
Denek Medresseh
Fountain
Mumuna
Su
Kaleh (50)
Houses
Haidari
Sultan (20)
Beirak D.
Chelebi D.
Yeshil Yaylasi (150)
Kumla Mezarlik
Kulla Dagh
Demirli Bel D.
Bedesten (?)
Beilerli
Kurghalu
Beilark
Ismail
Mills
Sulimanlu
Aridekler Impression
Hajilar
Sources
Baramsali
Mills
Sultibik
Ancient Fortress
Chesme Keupri
Chikmajik or Belelhan Dere
Khan & a few houses in Gok Gorge
Mosque
Ruins
Spring
Mines
Fountain
Tombs
Ruins
Ancient Fortress
Mills
Sources
Houses
Fountains
Spring
Ruins
Mosque
Tombs
Mines
Fountain
Houses
Ruins
Spring

34°
30'
KIZIL IRMAK
Goch D
Ereglibil Dagh
Dalije Su
Awliates
Awiler (60)
Alambali (26)
Ajdogymma (25)
Hajii Obasi
Salt mines
Karpas
Fadeli
Sersenli (50)
Eldelekli
Yuruk Yeri (100)
Yuruk Ozu (100)
Axredin
Karabekli (150)
Telegraph (Yuruk)
Bey Obasi
Gelevli
Gurlanguch
Denek Dagh
CHICHEK DAGH
EIGAR DAGH OR AGHARA DAGH
long high ranges
Kirkler D.
Kirkler K.
Tekerik K.
Eski Tapar
Balik Chai
Salman Keui
Gaimar
Eryk K.
Yenidler
Yazili Kaya
Champasha D.
Nohutlu D.
Soluk
Kota Goyumju
Kozaiis Oghlu
Salman Fakali
Azizli
Azizli Tepe
Bashini Yaila
Tumulus
Erkekli
Mar Oluk
Dewe
Injeli
Sedialer
Undulating and rugged
Serai Ova



ASIA MINOR

Route Survey between

ANGORA, KAISARIE AND

by

R. CAMPBELL THOMPSON,

1909.

Note; *This map is based on a prismatic compass traverse adjusted to latitudes fixed by sextan The variation of the compass at Evrek was fou*

Nat. Scale 1:750,000 or 1 Inch = 11·837 Statute

10 5 0 10 20

Route thus _____

Heights in feet.

Figures in brackets after village names indicate approxima

36°

OR

ween

AND EREGLI.

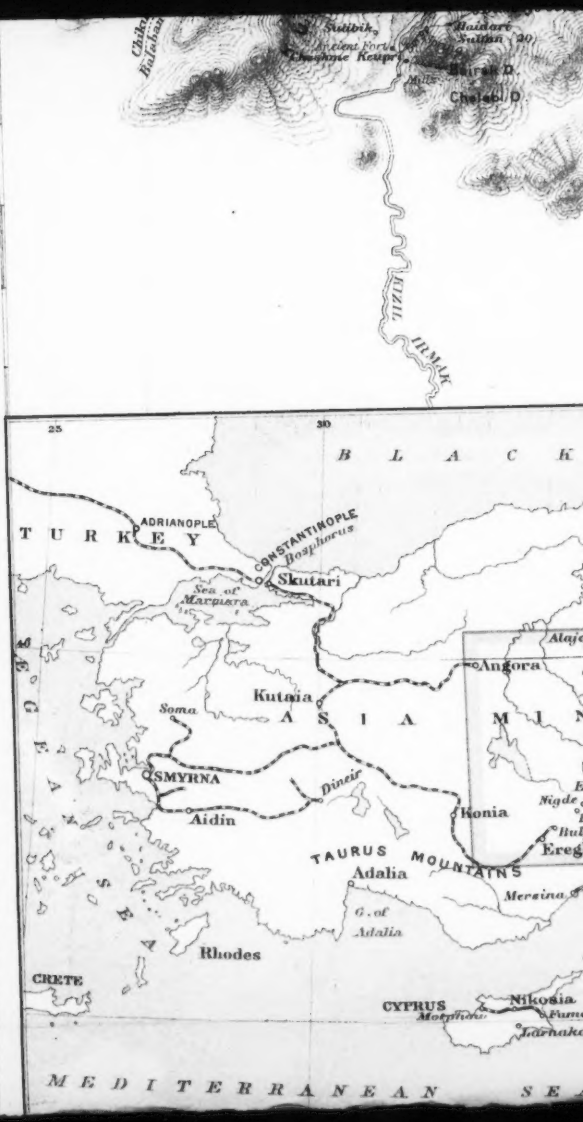
SON, M.A.

40°

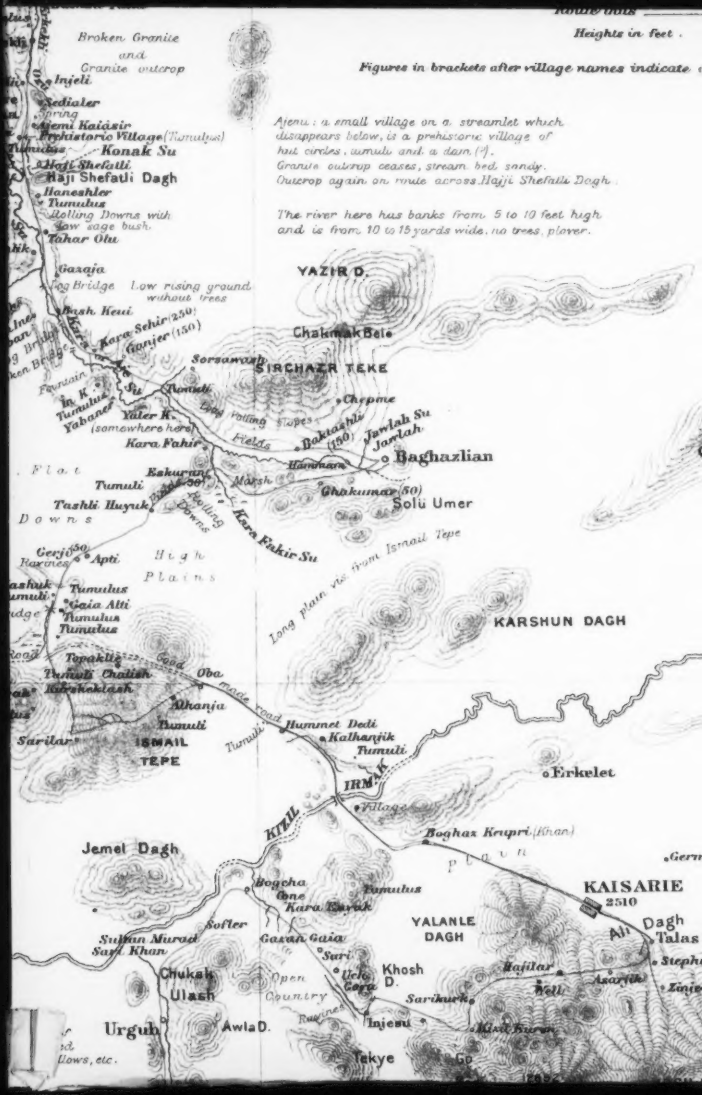
compass and plane table
by sextant observations.
k was found to be 3° 20' West.

Statute Miles.
30 30

pproximate number of houses.


Baidare
Sultan 20
Chelebi D.
30
IZMIR
ILMAK
25
30
B L A C K
TURKEY
ADRIANOPLE
CONSTANTINOPLE
Bosphorus
Skutari
Sea of Marmora
Angora
Kutaia
Soma
A S I A M I
SMYRNA
Dinzir
Aidin
Konia
TAURUS MOUNTAINS
Adalia
G. of Adalia
Rhodes
CRETE
CYPRUS
Nikosia
M E D I T E R R A N E A N

MALYA CHEULLU
Kazlusha, Gazusha or Galishawer Dagh
Tumulus
Erkekli
To Kizil Irmak
Mar Ollo
Dewe Ana
Ajemi
Garandera
Galishawer
Akbar
Tenlik
Long valley
Chibakli
Kabakli or Jabar
Log Bridge
Broken Bridge
GIJEK DAGH
Jashuk
5 Tumuli
Bridge
Village
Ronge
Berak
Savilan
Hikar Dagh
The valley
Urgub is we
gardens, Po
35
40
S E A
Sinope
Kizil Irmak
Batum
RUSSIA
Poti
Trebizond
Yeshil Irmak
Kelkid Irmak
Alaja
Yozgad
Sivas
Erzerum
Kara Su
Irmak
Kizil
Kaisarie
Murad Su
L. Van
Erjias D
Everek
Bidis
ANTI TAURUS
Diarbekr
Nigde
Bor
Hulgurlu
Eregli
R. Euphrates
R. Tigris
Adana
Birijik
Mosul
Ilaleb
(Aleppo)
G. of Iskanderun
Hama
Syrian
Desert
Ikosia
Famagusta
Larnaka
R. Euphrates


Heights in feet.
Figures in brackets after village names indicate
Broken Granite and Granite outcrop
Injeli
Sedialer
Spring
Ajemi Kaiasir
Prehistoric Village (Tumulus)
Konak Su
Hajji Shefaili
Raji Shefaili Dagh
Haneshler
Tumulus
Rolling Downs with low sage bush.
Tahar Olu
Ajemi: a small village on a streamlet which disappears below, it a prehistoric village of hut circles, tumuli and a dam. (?).
Granite outcrop ceases, stream bed, sandy.
Outcrop again on route across Hajji Shefaili Dagh.
The river here has banks from 5 to 10 feet high and is from 10 to 15 yards wide, no trees, plover.
Gazaja
Log Bridge
Low rising ground without trees
Kush Keui
Kara Sehir (250)
Gonjer (150)
YAZIR D.
Chakmak Bele
Sorsanush
SIRCHAZR TEKE
Tumulus
Yaldaner
Yaler K.
(somewhere here)
Kara Fakir
Chrome
Long rolling slopes
Fields
Baktashli (150)
Jarlab Su
Jarlab
Baghazlian
Hammam
Marsh
Ghakumar (50)
Solu Umer
Tumuli
Tashli Huyuk
Rolling Downs
Kara Fakir Su
Flat Downs
Gerjo (50)
Karnes
Apti
High Plains
Long plain viz from Ismail Tepe
KARSHUN DAGH
Tumulus
Gaia Alti
Topakli
Tumuli Chatish
Kabakaklash
Oba
Road
Alkanja
Tumuli
ISMAIL TEPE
Sarilar
Hummet Dedi
Kalhanjik
Tumuli
IRM
Erkelet
Village
KIZIL
Boghaz Krupri (Khan)
Jemel Dagh
Plain
Germ
Bogcha
Tumulus
Kara Kavak
KAISARIE 2510
Ali Dagh
Talas
Softer
YALANLE DAGH
Sultan Murad
Sarl Khan
Gavan Gaia
Suri
Ucko
Khosh
Cora D.
Hafilar
Stephe
Asarlik
Zinje
Chukah
Ulash
Open Country
Sarikuck
Well
Urguh
Awla D.
Injesu
Tekye
Go
Hows, etc.

n feet.

indicate approximate number of houses.

39°

GULU DAGH

KIZIL IRMAK

39°

Germir

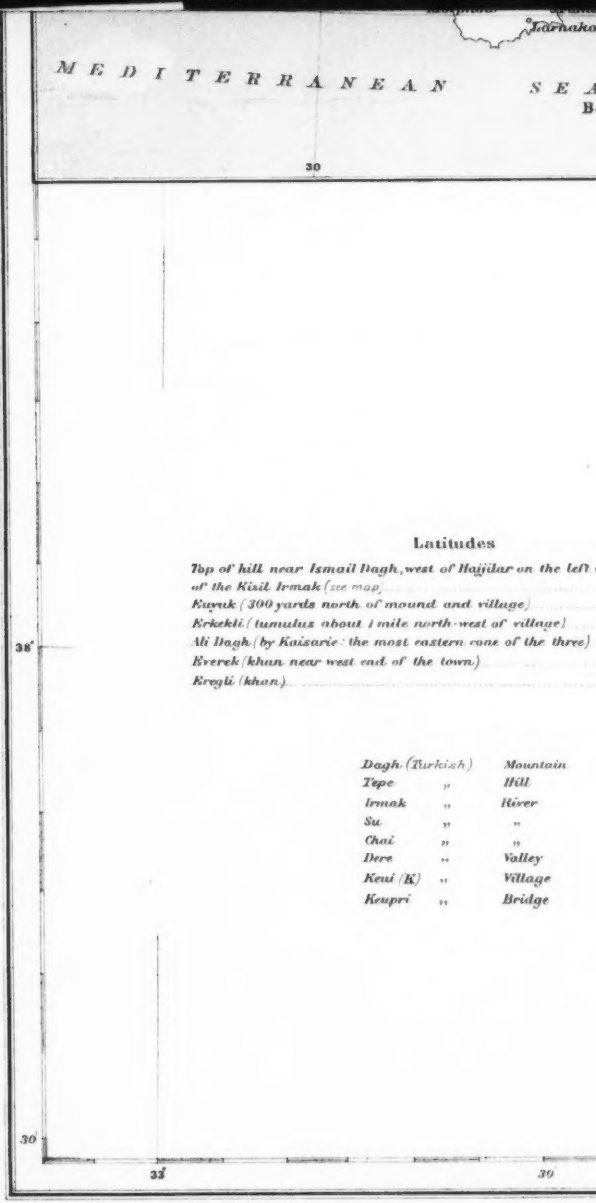
ARIE

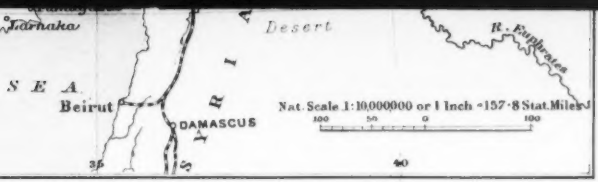
Dagh

Talas

Stephana

Tavidere


Tarhako
MEDITERRANEAN
SEA
30
Latitudes
Top of hill near Ismail Dagh, west of Hajidar on the left
of the Kisil Irmak (see map)
Kuyuk (300 yards north of mound and village)
Erkekli (tumulus about 1 mile north-west of village)
Ali Dagh (by Kaisarie: the most eastern cone of the three)
Everek (khan near west end of the town)
Eregli (khan)
38°
Dagh (Turkish) Mountain
Tepe " Hill
Irmak " River
Su " "
Chai " "
Dere " Valley
Kewi (K) " Village
Keupri " Bridge
30
35
30



The valley south of Urgub is well wooded gardens, Poplars, Willows, c

Berche

Kil

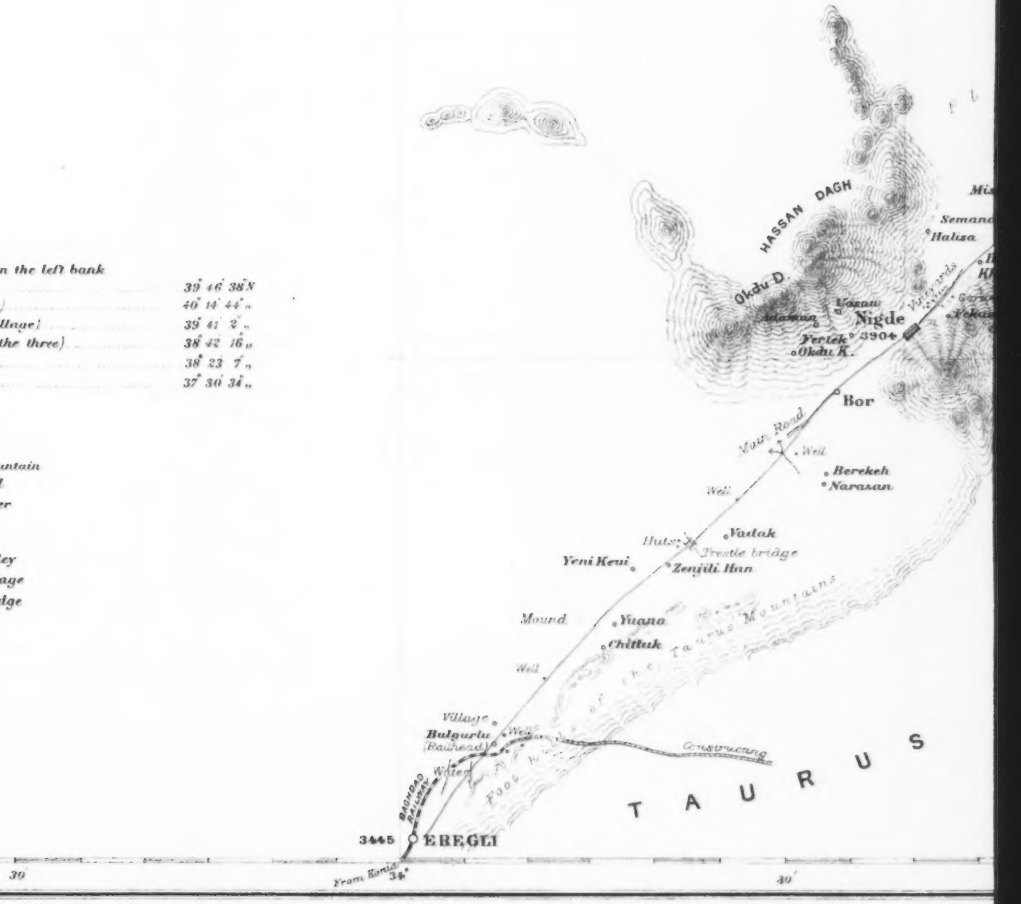
Ch

n the left bank

	39° 46′ 38″N
	40° 14′ 44″ „
llage)	39° 41′ 2″ „
the three)	38° 42′ 16″ „
	38° 23′ 7″ „
	37° 30′ 34″ „

ntain
r

ey
age
dge



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Urguh
Awla D.
Injesu
Tekye Dagh
Hodul D.
Tenuk
Tunsa (ruins).
Berchen Kil
Sowesha
Great Plains
Bash K.
Orta K.
Changne O.
Maurgan (100) Caves
Buldurui (?)
Develi kara hisar
Gardens
Soghanli Dere
Hassan Ner (4)
Kaleh Keui
Everek
Tumuli
Ili Punar
Sindel Euyuk
Karajoran
Well
Sarija
Kasik
Araplı Khan
Araplı Dagh
Ford
Chiftlik
Well
Musajili
Miste Keui
Ere Keui
Village
Volcanic mound
Charikle Keui
Buldurui Saws here
Madare
Tumuli
Miste Khan
Karatli Keui
Gelvasli
Yer Keui
Yaylak
Dundaji D.
Semandere
Zemzema
Halisa
Ulaj
Bantana
Handonal
Khan
Kikhaj
Boyajilik
Dashoj
Yahyale
Garakeui
Yekmana
PART OF BULDURUJ D.
ERJIAS DAGH (ARGAEUS)
UCH KAPULAR DAGH (KAPILI)
Dumberi D.
RANGES
35'

ASIA MINOR

THOMPSON

INDEX.

* Denotes Articles and Papers. † Bibliographical Entry.
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